GAS JOURNAL

LIGHT HEAT POWER BYE-PRODUCTS

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EDITORIAL NOTES.

The Gas Charge "Mystery."

DURING the past week, we have had another newspaper "stunt." Not long ago it was the charges for electricity. Now it is those for gas; and the miners and the weather ought to be thoroughly ashamed of themselves—the former for exposing such good employment providers as the gas industry to this sort of thing, and the latter for dealing severely with humanity just when the price of gas is high. The combination has not been exactly good for the reputation of gas. But exceedingly strange things have happened. Meters (which functioned correctly until high prices had to be paid for coal, and consumers used more liberally the fuel nearest to hand) increased their activities, according to report, against the buyers. Why they have been guilty of such unprecedented conduct is not explained. Consumers who, in view of the higher prices of gas, have been (so they say) economical have used more therms. Some say that this is due to the gas suppliers increasing the pressure of gas to such an extent that the mechanism of the meter is driven at a faster rate. Others allege that the quality of gas has been poor and pressure low, and that a greater volume of the more expensive gas has been needed to get the gas appliances to do their duty. The complainers know nothing of the stringent supply conditions and testings set up by Parliament and the Gas Referees, and carried out in the case of companies by not too sympathetic local authorities, who protect the public from any imaginary devices of gas suppliers to defraud them. We have seen assertions that gas consumption has gone up 20, 30, and even 50 p.ct. The total output of the companies shows that this cannot be general, because the increase on output in the quarter has been relatively small. Those who rush into print know nothing of these matters, and so they do not realize that they—combined with the facts that the expenditure on foreign coal used during and subsequent to the strike period has to be discharged, and that gas suppliers were not responsible for empty coal cellars and meteorological conditions during the past quarter—supply a complete answer to the allegations which have filled column after column of those newspapers which dearly love a so-called public grievance. Naturally no public utility industry likes such "stunts."

However, another mysterious side of the affair is that, while those who write to the newspapers form an infinitesimal proportion of the whole number of gas consumers, those whose accounts have not increased beyond the addition to the price of gas due to the uncontrollable circumstances of the coal stoppage do not trouble, as lovers of fair play should, to communicate their experiences to the papers. Yet they are in the majority. All the suggestions that have appeared in the papers as to the cause of the increased consumption are destroyed not only by the facts already mentioned, but by the one that the lower quality and the higher pressures have not had any influence upon the meters of the consumers whose accounts are only more by the higher price per therm, and not through an increased consumption of therms. The offices of the "JOURNAL" are in the area of the Gas Light and Coke Company. They are "all-gas" offices—gas being used for lighting, and office and water heating. Last year we had two geysers fixed in the lavatories, after the March quarter, and during the winter an extra fire has been used. Our consumption in the past quarter, as compared with that of last year, has been only 21 therms more; our account is higher by £7 10s. 6d. But this increase, less the cost of the extra 21 therms, is due to the higher price. The Gas Light and Coke Company show us no special consideration. The meter is the arbiter between us. The price is the same as to other consumers—perhaps it ought not to be; but we do not complain at sharing equally with our fellow consumers on the basis of service rendered. But why have not the hands of our meter gone round faster than usual, through the conditions alleged in the newspapers? The Company do not send a gas supply of special quality and pressure along Fleet Street for our benefit as compared with the other ordinary consumers. If we were unable, like so many members of the public, to see the silliness of the allegations, we should say, with the newspaper drummers, "It's a great mystery."

So long as meters and gas appliances cannot organize to defraud the public, so long as gas suppliers (if they were dishonest) are prevented by statute and public testing authorities from doing those things which they ought not to do, the newspapers who like to create and foster a public ramp of this nature should consider whether the human factor should not be taken into account, and whether that factor is not to be found in the houses of the aggrieved consumers. Within their dwellings greater control exists over consumption of any commodity than outside them. We see the City Corporation are looking into their gas accounts. This increase in consumption was 2½ p.ct.! The additional charge in their accounts was, therefore, due almost entirely to the necessary extra price per therm. Questions, too, are being raised in Parliament. This all comes of popularity, convenience, and a service, during the coal stoppage, which could not have been coped with in any other way than through gas mains.

Hygroscopicity of Sulphate of Ammonia.

A VERY useful investigation has been carried out by Messrs. J. Macleod, C. Chapman, and T. A. Wilson, of the Glasgow Corporation Gas Department, into the question of the differing moisture contents of sulphate of ammonia. The inquiry was initiated by an observation that, though the same type of drier was employed in each case, the sulphate produced, bagged, and stored at the Provan Works showed a widely differing moisture content from that at the Dalmarnock Works. Research was undertaken to ascertain the cause; and, through the kindness of Mr. Macleod and his fellow-workers, we have the pleasure of publishing to-day an article describing the work and the results. The investigation was carried out at both works with samples of salt from both, so that they might be exposed to the same conditions in the respective stores, and be subject to like examination. The first finding was that, though a difference in the sulphate produced commercially at the two works may account for a variation in hygroscopicity, the results obtained were chiefly attributable to the different conditions existing in the two stores—due to a large amount of steam from external sources entering that at Provan (which caused a higher percentage saturation of the atmosphere), and

the lower temperature existing over a large area of the store—thus tending to condensation and retention of moisture. These drawbacks could not be easily removed; but they suggest that, in building sulphate stores, the disadvantage of external steam entering requires to be guarded against, and that the temperature of the stores should be kept slightly above that of the outside atmosphere, so that condensation of moisture may not take place on the bags.

There is an additional consideration. Provan sulphate, while in the dry state, absorbs moisture initially more rapidly, and retains it more tenaciously, than Dalmarnock sulphate. Considering this might be due to the presence of some impurity in the Provan sulphate in greater amount than in the Dalmarnock sulphate, investigation was made to ascertain the effect of the presence of pyridine sulphate on the hygroscopicity of ammonium sulphate. The liquor from which the sulphate is produced is not the same at the two works. As stated by the authors, that distilled at Provan is the ammoniacal liquor from the carbonization of coal in Woodall-Duckham vertical retorts; at Dalmarnock, the retorts are Wilson verticals. Then the whole of the gas produced at Dalmarnock is subjected to acid washing, so that about 5 p.ct. of the make of sulphate at Dalmarnock is from the gas-washing plant. This, of course, arrives as ammonium sulphate, and is mixed with the mother liquor. A further difference is that at Dalmarnock an open-type saturator is employed, the three cracker pipes entering at the open front of the vessel, and passing under the curtain to the back, whereas at Provan the cracker pipes enter the vessel at the back, and pass towards the front. In these circumstances, it was thought that the Dalmarnock sulphate might contain less pyridine sulphate than that produced at Provan.

However, the effect of the presence of pyridine sulphate on the hygroscopicity of sulphate of ammonia presented difficulties. How the authors proceeded, and the data they realized, are all presented in the article. The conclusions drawn from the data are that the presence of pyridine sulphate as an impurity on the face of the crystals does raise considerably the hygroscopicity of the salt; and the amount necessary to produce this effect is very small—the effect being roughly proportional to the amount of pyridine sulphate present. The effect may be due to the pyridine sulphate itself, or to the trace of residual sulphuric acid left as a result of the dissociation and decomposition of that substance in the process of drying the contaminated ammonium sulphate. To a considerable extent, the effect can be minimized by drying the ammonium sulphate crystals in the presence of free ammonia gas, which may act either by displacing the pyridine, or by neutralizing the trace of free residual sulphuric acid. The research proved that the containers used to store and transport the sulphate have little or no effect on its hygroscopicity.

We have to thank Messrs. Macleod, Chapman, and Wilson for kindly placing the particulars and results of this research before our readers. The question of the moisture content of sulphate is an important one commercially—as complaints of caking have shown. The work proves that though the moisture present in sulphate may be, by drying, brought down to or below the prescribed amount, this is no guarantee that, through the presence of pyridine sulphate on the face of the crystals, there will not be further moisture absorption, unless steps are taken to minimize or negative activity in this respect.

The Johannesburg Contract.

In these times the political divisions which lead at Westminster to opposition or support without consideration of merit is, unfortunately, a growing feature in local government. Not only is this the case in this country, but it is found abroad. Small excuses often serve for hostility. The Johannesburg Municipality have just had an example of this—not perhaps, other than slightly, on political grounds, but on a point of a very unsubstantial order—in connection with their new gas-works. Luckily, the Tramways and Lighting Committee were in a strong position, inasmuch as, in the selection of the tender under which the new works are to be constructed, they, with the sanction of the Corporation, had appointed Mr. W. R. Herring, M.Inst.C.E., to advise them—not from a distance, but at Johannesburg, and after an investigation into local conditions and requirements. This was a wise step, as the Committee and the Council had the benefit, in respect of the tenders for the work, of independent and wholly disinterested expert advice. At the last meeting of the Municipality in March, the Committee recommended the adoption of the tender submitted, by Messrs. Blane & Co., on behalf of West's Gas Improvement Company. The resolution gave the contract price as £158,160. An attempt was made to get the recommendation referred back—a protest having been filed by an agent for one of the tenderers, against, so we gather, an adjustment in one of the items. In this case, the tenders, it appears, had been framed in such a way that—this before Mr. Herring had anything to do with them—it was left open to each tenderer to submit his own scheme. Obviously, as the Chairman of the Committee (Mr. Councillor W. Fearnhead) said, there must be in such circumstances adjustments before there could be an ultimate decision as to which tender to accept. This was one of the reasons for the resolve to obtain the services of an expert, with a free hand, to adjudicate upon the tenders. The value of this was seen in the solid vote which was given in the Council in favour of the Committee's recommendation—25 votes to 2; the latter being the mover and seconder of the amendment to refer back the proposal. It was evident to the Council that the Committee had done all possible to secure a good works at a fair price for the city. We congratulate them and Mr. Herring upon the vote, attesting as it does the full confidence of the Council other than (if we accept the vote as an expression of their view) of the two Nationalist members. All the Labour members voted in favour of the scheme with the "Ratepayers"—a term not usually applied to municipal representatives in this country.

The Aldershot Combination.

It is sometimes asserted that gas suppliers who are also providers of electricity for the public have no incentive to push the sale of the latter; and they are supposed to do all manner of queer things to foster gas at the expense of the electrical part of their business. The folly of these assumptions ought to be apparent from the single consideration that to spend capital, which is about the heaviest charge in the supply of electricity, and simply use it as a barrier to injury to gas trading would be the procedure of a set of lunatics, and not of business men. The folly of the assumptions is also proved by experience. We have in the gas industry combined gas and electricity services, both of which are expanding; and the prices of both to the consumer, under normal conditions, are being reduced. Tottenham, Ascot, Aldershot, and other companies supply examples. The Aldershot Company are unique in that they supply gas, electricity, and water; and they find that the electricity supply—like the gas supply—is extending so rapidly as to have necessitated extensions of the plant. In last week's issue, we recorded the laying of the foundation stone for extensions of the electricity generating station at the North Camp and Farnborough Works, which evidences that the electricity service under the Company's administration is expanding. Jealousy blinds some electrical men to such an extent that they cannot see any scope for economy in amalgamating gas and electricity supplies; but Aldershot, as Mr. R. W. Edwards, the Chairman and Managing-Director of the Company, on the occasion showed, attests that there are several economies which are realized by unity of working between the various departments—and more still will be brought into account when the steam plant at the water-works is supplanted by the electrical drive. As is the case with gas-works plant, the water-works plant will later assist in producing that diversity of demand which, there is ample electrical authority for saying, contributes largely to the improvement of the load factor, and therefore to the efficiency and economy of generation. Also, there is nothing to prevent the utilization of coal for gas making, and coke and breeze not required for gas production being applied to steam-raising

for the generation of electricity. The potentialities are great, especially in an area where coke is not in large demand. We rather think some of the experts of the electricity industry will be, having regard to the character of the area of supply, astonished at the high load factor which has been achieved by the Aldershot Company. This is very pronounced in the winter months; but even all the year round the Company can show figures which may cause envy in some of the largest electricity supply stations. In 1925, the highest weekly load factor was 48 p.ct.; in 1926, 42·9 p.ct. Considering the present stage of development, the Company's charges are also low, and will compare well with the average of those obtaining in the Metropolitan area. There is good optimism on the part of Mr. Edwards as to the reduction progressively of the charges. At midsummer the first step is to be taken by a reduction of ¼d. per unit; and, governed by the quantity consumed, a scale of discounts operates which has been extended to 50 p.ct. for day load users. The reduction at midsummer will bring the minimum charge down to 1·875d.; and it is hoped that at an early date this will be lowered to 1·5d. In 1915, the Company's charges for lighting and heating were respectively 6d. and 2d., both rates being subject to discounts up to 25 p.ct. From what has been said, it will have been gathered that the prospects of getting back to these figures, and even to lower ones, are promising. Such conditions prove that, when gas undertakings enter into the supply of electricity, they do so with the view of making it pay; and they are keenly alive to the fact that the lowest practicable charges are in this line the best possible builders of sound business. If our electrical critics take Aldershot as an example of what can be done, and is done, by combination of gas and electricity supplies—making allowance in comparisons for differences in local circumstances—they will not go far wrong in reshaping their ideas on the subject.

Trade Disputes Bill Manœuvres.

LAST week witnessed several movements having for their object, on the one side, the mobilization of forces against the Trade Disputes Bill, and, on the other, the development of the speech-making campaign by Ministers and their supporters for expounding in all quarters of the country the necessity for, and meaning and intentions of, the measure. Attempts were made to get the Government to suspend the introduction of the measure by advancing argument in favour of that course; threats were made from Communist quarters in the shape of a plan of intensive campaign to culminate in a general strike of all workers if the Government did not withdraw the Bill. No better suggestion than a full-blown general strike could have been advanced by the plotters to show the need for the measure. The Government stood firm, and adhered to their arrangements. Some members of the Liberal Party and of the General Council of the Industrial Alliance consider the present an inopportune time to introduce the Bill. In our opinion, opportuneness would become more and more remote the further the events of last May and, in fact, of the entire year recede in time and memory. The Executives of the trades unions have also developed a plan of campaign against the Bill; but they prefer to do as they think fit, and, properly, will not brook any dictation from the Communists. They have had enough of the Communist tail directing the movements of the body of trade unionism. Had they been as firm a year ago, there would have been no general strike, the coal stoppage would not have been so protracted, and in all probability there would have been no Trade Disputes Bill. It was through permitting extremists to direct actions last year that a revelation was made to the country, and caused the Government to take the steps necessary to protect the community from similar offences against the Government, the law, and the common weal.

A general strike can have only one intention, and that is to produce a state of general turmoil and starvation in order to bring the Government and the country into submission to the wills of the trade union leaders. There can be, and is, no other objective. The country have a strong preference to be governed by the elected Parliament, and not by the officials of trade organizations. Orderly government and not disorderly is the most favoured method in all civilized countries. But Mr. J. Ramsay MacDonald, the leader of the Parliamentary Labour Party, can only see in the Bill "hate and spitefulness;" if this is so, we wonder what his vocabulary would yield fairly to describe the action of the "T.U.C." against the country last May. Feeble talk such as he indulges concerning this matter will not disturb the intelligences of the major part of Great Britain. He also asserts that, if the Bill becomes law, no trade union will know what are its responsibilities. That is precisely what the Bill seeks to make clear; and we give the leader of the Opposition credit for the possession of sufficient brains to appreciate this—despite his obvious panderings to the gallery. It is fully apparent from what took place twelve months ago that the trade union leaders did not then, and (if we are to believe their own words) do not now, know what are their responsibilities—"responsibilities" in the fullest sense of the word. They know very well that the Bill will make plain what was nebulous before, and will assist to keep the trade unions to their legitimate functions, which is what many members of the unions desire, as they are utterly sick of the uncertainty which has been created since the extremists by stealth obtained such a big footing in the government of the trade organizations. The leaders of the unions are well aware of this. What is really worrying them is that last year's events sent trade union membership and funds down with a run; and they are making use of this Bill to try to retrieve the position in both respects, and also to re-establish their own credit and power among the industrial workers of the country.

This week the Bill is under discussion in the House. It started on Monday, and will continue until to-morrow. Mr. MacDonald acknowledges that, whatever tactics are employed by the Opposition, the measure will be passed. But he holds out the threat that as soon as the country entrusts the Labour Party with the necessary power, they will remove the "disgraceful smirch" from the Statute Book. ¶n this threat the country—with the experiences of last May before it—will find a good reason for not again entrusting the Labour Party with power because the removal of the so-called "disgraceful smirch" would at once expose the country and the members of the unions to the same state of chaos that obtained a year ago through misleadership and a false sense of power in excess of that of the nation itself.

Unwanted "All-Electric" Houses.

The "Liverpool Echo" for last Saturday published an article which revealed the pitiful condition of over 100 all-electric houses which have been erected by the Corporation Housing Department. It states that these houses are all vacant, and that there is scarcely an unbroken window among them. The houses are on what is known as the Walton Hall Estate, where the juvenile population have been having the time of their lives bombarding the windows with stones. A suggestive paragraph appears in the article. It is as follows: "Apparently, despite the thousands of visitors to the electric house lately erected on St. George's Hall Plateau, all-electric houses are not appealing to the tenants for whom they were intended in Liverpool." Our local contemporary in its issue for May 2 asks: "Why don't the all-electric houses appeal to home seekers and get taken." Echo answers, "Why?"

Acknowledgment of Good Services.

As will be seen by a report in later columns, the administrators and chief officials of the gas undertakings in the Manchester District of the National Gas Council have shown their heartfelt appreciation of the extraordinarily helpful services which their Hon. Secretary (Mr. J. H. Sillitoe, Secretary of the Manchester Corporation Gas Department) rendered to them during the memorable troubles of last year. At a luncheon given in honour of Mr. Sillitoe on Tuesday last week (at which a presentation was made to him), Alderman F. S. Phillips (Chairman of the Salford Corporation Gas Committee, aptly summed-up the position by saying that, at the end of April last year, when the great misfortune fell upon the country, Mr. Sillitoe rose to the opportunity for service, instead of leaving them, in their

various localities, to fight with the difficulties of getting supplies of coal when and where and how they could. He conceived the idea that, by combining the requirements of the undertakings, and dealing with them collectively, it would be much better for everybody, and incidentally save a great deal of money. The result was that cargoes of coal were much more easily secured; there was greater regularity about their dispatch; and economies were effected in the prices paid. This, as Alderman Phillips said, was not a small achievement. All the speakers paid tribute to the great organizing ability, energy, and zeal which Mr. Sillitoe displayed throughout the emergency.

Institute of Fuel.

Some time ago the view was expressed in these columns that fuel technology should not become loaded and hindered by competing bodies, but that there should be unification in order that there might be co-ordination of activities to secure greater and quicker advance. The consummation has been realized—we do not claim through our suggestion, but through the common sense of those concerned. At a meeting last Friday, the final steps were taken for the fusion of the two organizations, and the inauguration of the new association under the title of the Institute of Fuel. The new Council will be elected in the autumn; and, meantime, Mr. H. L. Pirie and Mr. Edgar C. Evans are to act as Joint Hon. Secretaries of the Institute. The President is Sir Alfred Mond, who is also the Chairman of the National Fuel and Power Committee. He fully recognizes that the existence of a single technical body concerned in fuel in all its aspects will be of greater co-operative value to the Government Committee than two organizations. Sir Alfred incidentally stated that the Committee are progressing satisfactorily with their work.

Wareham Electricity Promotion.

Another winding-up of a Cannon Street flotation was effected on April 26, when the Wareham matter came before Mr. Justice Eve. It had been hoped that the case would have been fully investigated before his Lordship; but this fell through, and the usual compulsory winding-up order was granted. In making the order, his Lordship said he assumed that there were a number of matters requiring investigation.

Road Fund Appropriation.

The decision of the Chancellor of the Exchequer to appropriate, in view of the condition of the national finances after last year's troubles, £12,000,000 from the Road Fund is causing considerable annoyance to the Associations representing motor vehicle users and the Roads Improvement Association. At the annual meeting of the last-named body, Mr. Rees Jeffreys (the Chairman) referred to the raiding of the fund as "the shadow of a great disaster." We hardly think that the term "shadow" is suitable for application to a sum of £12,000,000. However, in his opinion, the movement for better roads has, through the action of the Chancellor, received a serious set-back. The programme of road improvement and development would have to be largely abandoned; but the transfer from the Fund has a still larger effect, in that uncertainty has been engendered as to what future chancellors may do in utilizing the Road Fund as a source of revenue. It may even be thought desirable to increase the tax in order to provide more money for purposes other than the betterment of roads. Mr. Rees Jeffreys regards expenditure on roads and bridges as one of the most productive and economical of purposes upon which public money can be spent. There is no question that, with the ever-increasing volume of road traffic, outlay on our roadways should have regard to the future, as well as to the immediate present.

PERSONAL.

Dr. W. R. Chapman, of the Department of Fuel Technology, Sheffield University, has joined the technical staff of Sensible Heat Distillation, Ltd., and "L & N" Coal Distillation, Ltd.

Congratulations to Mr. Percy Beaumont, of Messrs. W. G. Beaumont & Son, whose marriage to Mrs. K. L. Halton, of Hove, took place on April 27, at St. Martin's-in-the-Fields, Charing Cross.

Mr. F. H. W. Harry, Assistant to Mr. J. W. Gibson, A.M.I.Mech.E., Engineer, Manager, and Secretary of the Launceston Gas Company, Ltd., has been appointed Manager and Secretary of the Northern, Appledore, and District Gas Company, Ltd., and will commence duties there on Aug. 1 next. Mr. Harry has been with the Launceston Company over seven years. He received his early training under Mr. R. G. Luxon (now of Guernsey), and his subsequent training under the present Engineer, who is the inventor and patentee of the "Simplex" and "Gibson" (new) C.W.G. plants, which are daily in use in many gas-works at home and abroad.

Mr. J. P. McCrae, Assistant Engineer to the Derby Gas Light and Coke Company, has been elected Chairman of the Derby Society of Engineers.

Mr. D. Yule, of the Edinburgh Corporation Gas Department, has been appointed Distribution and Gas Sales Superintendent of the Alloa Corporation Gas Department. Mr. Yule is the Honorary Secretary and Treasurer of the Eastern District of the Scottish Junior Gas Association.

To the great regret of the Society of Chemical Industry—and especially to the Council—Mr. E. V. Evans has announced that pressure on his time compels him to resign the position of Hon. Treasurer, which he has filled for several years past to the entire satisfaction of the members.

Mr. S. A. Croker, Works Cashier, who is about to retire after 46 years' service with the Plymouth and Stonehouse Gas Light and Coke Company, was presented on Thursday, April 28, with a pair of binoculars and a smoker's cabinet. In asking Mr. Croker's acceptance of the gifts, the Company's Chief Engineer, Mr. P. S. Hoyte, mentioned that during his association with the Company considerably over £1,000,000 in cash had passed through Mr. Croker's hands. Good wishes for health and happiness in his retirement were also extended to Mr. Croker by the Secretary, Mr. G. H. Bolton, the Chief Assistant Engineer, Mr. R. J. H. Clark, the Distribution Superintendent, Mr. J. A. Richmond, and the Works Foreman, Mr. J. W. Walters.

The 79th birthday of Mr. George G. Ramsdell, Librarian of the American Gas Association, has been marked by the presentation to him by the Executive Board of the Association of a case of pipes. Mr. Ramsdell's experience of 50 years in the gas industry has included 47 years of Association work. For the past 25 years he has been Secretary of the Society of Gas Lighting. There is, declared Mr. A. B. Macbeth, the President of the American Gas Association, in making the presentation, no man more widely known or more generally honoured in the industry. As long ago as 1911 Mr. Ramsdell was appointed Secretary and Treasurer of the American Gas Institute—as the national organization was then named. He is a Past President of the Western Gas Association and the American Gas Light Association. In 1900 he was one of the two American Association officials to attend the International Gas Congress in Paris.

OBITUARY.

DR. GEOFFREY WEYMAN.

It was with the most sincere regret that we learned of the death, which took place on Friday, April 29, at his residence, "Long Close," Hexham, of Dr. Geoffrey Weyman, F.I.C., Chief Chemist to the Newcastle-upon-Tyne and Gateshead Gas Company. He underwent a serious operation in a nursing home some weeks ago; but his condition subsequently became more grave, and he gradually lost strength.

Dr. Weyman, who was in his 38th year, had been in the service of the Newcastle Gas Company for about seventeen years, and was held in high esteem for his scientific attainments. He was a valued contributor to the Technical Press; and in this respect readers of the "Journal" frequently had occasion to feel grateful to him. As recently as January last he discussed in our pages some experiences with American and other coals during the disastrous miners' strike. He was also the author of several technical books, including the well-known work "Modern Gas-Works Chemistry." From time to time he contributed papers to the North of England Gas Managers' Association, and took part in the discussions. In the field of invention may be mentioned his patent "Rayflex" open-fire coke stoves, an illustrated account of which appeared in the "Journal" a few weeks ago. He had been Chairman of the Auxiliary Section of the North of England Association, and was one of the founders of the Newcastle Chemical Industry Club, of which he was Librarian for several years.

Deepest sympathy in their bereavement will be felt with his widow and three children. The interment was on Monday, in Lamesley Cemetery.

ELECTRICITY SUPPLY MEMORANDA.

THE new power station at Poplar has been started; the inauguration having been performed by Sir Andrew Duncan, the Chairman of the Electricity Board, and the new "lion" on the electrical stage. For the work, the Borough Electrical Engineer (Mr. J. Horace Bowden) has been responsible. A great deal of publicity has been given to the new plant, which, it is stated, has raised the capacity of the Poplar undertaking to 26,000 KW., which translated into thermal energy represents only 887·12 therms—the new addition being 10,000 KW., which converted into thermal energy means 341·2 therms. Piecing together information from two sources, we find that, with the old installation, fuel equal to 33,000 B.Th.U. per KW.-H. was used, and with the new one 18,000 B.Th.U.; and that, with the pulverized fuel firing in the new plant, slightly inferior coal can be employed at 16s. per ton, compared with 20s. per ton with the old system. This shows that with the old system the thermal efficiency was 10·34 p.ct.; with the new plant, it will be 18·9 p.ct.—in other words, in the process of conversion from coal to electricity with the new plant 81·1 p.ct. of the heat will still be expended. Of course, the 18·9 p.ct. efficiency will be reduced by the extent to which the old plant will have to be worked. It is also stated that, whereas the cost of fuel with the old plant was 0·323d. per unit, the cost with the new plant will be 0·143d.—a saving of 0·180d., which, it is thought, will open up "an immense new field for electricity—notably in competition with other forms of heat supply." Utilizing the 0·323d. per unit with coal at 20s. per ton, and the 0·143d. per unit with coal at 16s., it is easy to calculate that with the old plant about 743 KW.H. were generated per ton of fuel, and with the new plant 1342 KW.H. per ton—the former requiring about 3 lbs. of coal per KW.H., and the latter 1·67 lbs. Fuel is a small constituent of the total cost of electricity delivered. Sir Andrew Duncan stated at the inaugural luncheon that the annual sale of energy by the undertaking is now over 30,000,000 KW.H., which is equal (at the round figure) to 1,023,600 therms.

Poplar's New Efficiency.

It appears that rural authorities are not all taking kindly to the provision that a benevolent Government have made to supply them with a "cheap and abundant" service of electricity. They are accused of being wanting in knowledge and appreciation of the benefits that are coming to them; and landowners are charged with being obstructionists. There are some people who are in too much hurry. The contents and benefactions of the Act of last year can hardly have penetrated into the rural areas and minds; and certainly nothing sufficient has yet been done under the new legislation to warrant the exercise of pressure. But a deputation of members of Parliament have interviewed Sir Harry Haward, representing the Electricity Commissioners, to express disappointment at the delay in providing rural areas with electricity. With the passing of the Government measure, probably they expected that little more had to be done than to move a switch. The difficulties met with in obtaining wayleaves is another sore point. These gentlemen seem to think that more power should be given to electricity undertakings to deal with "final objectors"—not always the landowners—who raise trivial objections. They allege that sometimes the Post Office, railway companies, and Government Departments are the guilty ones. The actual cost of the work is oftentimes increased by as much as £200 in obtaining a landowner's consent for a supply line to run over his land. The cost of H.P. lines is also high—running up to £1200 to £1300 per mile. The people in the rural areas, so it is alleged, are not aware of the fact that it is not practicable to use buried cables for many of the transmission schemes; and they do not realize the necessity for overhead lines. What they do realize is that they do not approve of their areas being disfigured by posts and overhead lines for the conveyance of a commodity. Gas undertakings have to put their pipes underground; why not electricity suppliers? It is thought that more should be done in rural areas to explain the new legislation, and to educate the powers that be in them as to the needs of the electrical situation. Another thing that has not hitherto been recognized is that, apart from the main transmission lines, it will be necessary to construct in each locality a subsidiary transmission system. The Commissioners were urged to do several things to enlighten these unintelligent folk in rural areas; and to add to their already complex functions the work of compiling an approved schedule of reasonable pole rentals, and to make it clear that no sanction can be given for excessive charges. The schedule should have a broad foundation. It should be prepared on the bases of the size of the poles, the necessary trenching of the cables, the different types of land and crossings, and the method of erection employed. We expect the Commissioners wish people would leave them to pursue their developing work peacefully. They have enough in hand to keep them busy for a period without being troubled by intruders and suggestions which are not really pressing.

Supply in Rural Areas.

Some useful figures for gas engineers to have before them were presented by Mr. Morley New at a recent meeting of the Electricity Committee of the Cardiff Corporation. They refer to the scheme for assisted wiring. It appears from the statement that the Cardiff Branch of the Electrical Contractors' Association (which include ten out of the eleven registered contractors operating in the city) submitted a single tender fully detailed as to quantities, labour, &c. A discussion with them produced a revised lower tender; the following being the prices: Five lights, £5 4s. 1d.; six lights, £6 3s. 4d.; seven lights, £7 2s. 6d. These prices allow for vacuum lamps throughout, and two fancy opal shades. The arrangement is that the contractors shall collect direct from consumers for any extras at agreed prices before commencing the wiring work. The installation costs (excluding the usual service costs common to all consumers) will be: Five lights, £3 7s. 1d.; six lights, £9 6s. 4d.; seven lights, £10 5s. 6d. If 8d. per unit is charged, it will allow 3·75d. above a flat rate of 4·25d. to meet the total capital charges. Based on the cost to the Corporation, the consumption of 800, 900, and 1000 units for five, six, and seven lights at 8d. is required before an installation is the property of the consumers, and ordinary rates apply. It should be mentioned that the scheme has still to be considered by the Finance Committee before its submission for final acceptance by the City Council.

Assisted Wiring at Cardiff.

Owing to a breakdown at the Broadstairs electricity station on April 16, many holiday makers at the local hotels and restaurants had to dine by the aid of the primitive candle. Much inconvenience was suffered by the visitors; and concert parties had to carry on by the aid of candles. On April 25, the electric current in a large area around Aldersgate Street in the City was cut-off through an explosion in an underground electric transformer station in Falcon Square. The report states that a considerable amount of damage was done to the insulation of the electrical connections. A fire also broke out in an underground chamber; but this was speedily extinguished, although considerable alarm was felt in the district when a huge volume of smoke issued from the manhole. Regarding the recent disaster at the Wharncliffe Woodmoor Colliery, near Barnsley, when three men lost their lives, it was stated at the inquest that it was due to a fall of roof cutting an electric cable used for haulage purposes, with the result that fire broke out, and a dozen men, cut off by the fall, were overcome by the fumes. The statement that the electric cable was cut is what may be described as a fair assumption; it cannot be definitely asserted, because at the point where the fall occurred about seven yards of the cable was absolutely burnt away. It was reported in the Press last Thursday that, on the previous day, a fire occurred on the upper floor of the Park Lane Hotel, Piccadilly. It was soon suppressed; but it was attributed to the over-heating of an electric iron.

Mishaps.

There is substantial evidence of a revolt on the part of buyers against manufacturers of electrical plant in this country. The Southern Railway Company have given them a very nasty shock; and the Mansfield Corporation have followed this up with another uncomfortable twinge. The Railway Company have passed to a Swedish firm a contract which has a value of £120,000, the greater part of which sum will therefore be spent abroad, and not in this country. The Swedish firm, it is stated, quoted an appreciably lower price than British firms, though this was not the governing factor with the Railway Company. The course the Company have taken, it is asserted, is really due to the indications of the existence not only of a price agreement between British electrical manufacturers, but of some sort of quota agreement to restrict the output of individual firms. This has irritated the Company, as they regard it as dictation to them regarding the sources of supply of their plant. We need not go into the details. On their part, the manufacturers have put up a defence. From one quarter, it is stated that the contract was looked upon as a very large one from a single purchaser; and it was therefore thought by the manufacturers that it would be to the common good if it was divided between a small number, so as not to interfere with their service to regular clients. This is an admission that some sort of understanding does exist; and Mr. D. N. Dunlop, the Director of the British Electrical and Allied Manufacturers' Association, candidly admits that an arrangement does obtain in the industry whereby business is distributed under an agreement. He holds that such a system is an economic necessity, having regard to present-day trading conditions, and that there is no secret about it. The Railway Company, he states, asked three British firms to tender; but

Electrical Plant from Abroad.

these firms, who are pretty busy, were unable individually to undertake to fulfil the order exactly as desired by the Company, who did not give other British firms a chance before passing the order to Sweden. In the view of Mr. Dunlop, co-operation between manufacturers is really a good thing, particularly in view of the fact that on the Continent manufacturers work together in rings internationally, and make great efforts to get British business. In this connection, it must not be overlooked that the railway companies themselves have a monopoly of their particular form of transport; and they also have been grouped for the express purpose of effecting economies. It is likewise well known that they combine in fixing rates. Indeed, the railway systems form the biggest combine in the country for arranging prices. The difficulty of obtaining concessions from them is a general experience. However, the loss of this big contract has no doubt provided a lesson which will cause both sellers and buyers to review their respective conditions before allowing contracts to go abroad which could be quite as well carried out in this country. As a matter of fact, Mr. Dunlop himself says that, as a result of this loss, the manufacturers here will be "impelled to make still greater efforts to please their customers." This shows that there is a desire to let the matter drop. Meanwhile, however, the Mansfield Corporation have decided to accept a Dutch tender for an electric cable; the quotation from Holland being 20 p.ct. below the figure of English firms. Councillor Hardy, the Chairman of the Electricity Committee, states that the only way to bring the cable makers forming the English ring to their senses is to make them put their goods on the market at competitive prices with those abroad. The Corporation consider that they cannot pay high prices to the detriment of their own ratepayers; and so, perforce, current will be conveyed to Mansfield homes through cables made in Holland. There can only be regret over this state of affairs, as, with the large mass of unemployment in this country, work is badly wanted. A difficulty is that the conditions of manufacturers in this country, in respect of labour and materials, are very different from those existing on the Continent.

Electricity in the Irish Free State.

Those electrical men in this country who do not entertain any good opinion of the intervention by the Government, through the Electricity Supply Act, in their affairs will thank their lucky stars that they are not under the Free State Government. They have in hand a Bill which proposes to make provision for the reorganization and regulation of the generation, transmission, distribution, and supply of electricity, and in particular for the management of the Shannon scheme. The various General Electricity Supply Acts passed by the British Legislature which have hitherto governed electricity undertakings in Ireland, are to be thrown overboard. A Board is to be set up, constituted of three to seven members, The State have no desire to make a profit; but the Board are to calculate their rates of charge at such a level as to repay all costs incurred, including interest and sinking fund, and provision for depreciation and a reserve. Thus the Board will be self-supporting; and will finance themselves from the sales of current. In addition to operating the Shannon works, the Board are to control, co-ordinate, and improve the supply, distribution, and sale of electricity. Energy may be supplied either in bulk or to individual consumers, but not (without consent) to persons or premises within the area of supply of an authorized undertaker. The Board may be the authorized undertaker for any at present unoccupied areas. Into the administration or financial position of any authorized undertaking, the Board may hold investigations, with witnesses on oath, and anyone refusing to give such evidence may be mulct in £25. Users of electrical apparatus may be required to give evidence to the Board, and be fined for refusing to do so. No one may sell electricity without a permit if not an authorized undertaker; even then the permit may be modified or revoked by the Board as and when they think fit. Power is given to acquire the undertaking of any authorized undertaker, by notice in writing that on such and such a date the concern is to be handed over. On the service of the notice, the undertaker ceases to be authorized, though he "shall continue to carry on his undertaking until the date of the Vesting Order." A "fair value" is to be paid, with 5 p.ct. interest when the sum has been determined. Failing agreement, the matter will go to arbitration. By Order, the Board may take control, at any time, of an undertaking. At three months' notice, they can come in and take over the whole concern, and run it for not less than the minimum period (if any) under the Act, nor more than five years. Profits earned during control may be paid either into a reserve or a renewals fund for the benefit of the undertaking, or be paid to the authorized undertaker, and be applied according to law as profits. Losses incurred during control are to be paid by the Board; but they may recoup themselves from the reserve or other funds of the authorized undertaker. At the end of the control period, the Board can either take over the concern, or hand it back to the undertaker. Areas of supply may be extended or reduced by the Board. The Board may manufacture, and they and any authorized undertaker may provide, sell, and let on hire, electrical apparatus. Electrical tariffs for all undertakings are to be fixed by the Board. Should the Board decide that a generating station is not required, the statutory undertaker is allowed, with their consent, to sell the plant. Among general provisions, it is seen that the Board may grant permission to gas undertakers to become electricity suppliers.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

May 6.—London and Southern District Junior Gas Association.—Annual business meeting at the Westminster Technical Institute at 7.30.
May 7.—Midland Junior Gas Association.—Visit to the Foleshill Works of the Coventry Gas Department.
May 7.—Scottish Junior Gas Association.—Meeting at Dunfermline. Papers will be read by Mr. W. S. Johnston, of Dundee, and Mr. Geo. Keillor, of Dunfermline.
May 10.—Federation of Gas Employers.—Meeting.
May 10.—National Gas Council.—Meeting.
May 12.—Midland Junior Gas Association.—Annual meeting.
May 19.—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—Meeting at Abergavenny.
May 20.—British Commercial Gas Association.—Manchester District Conference at Buxton.
May 20.—Southern Association of Gas Engineers and Managers.—Visit to the Nine Elms Works of the Gas Light and Coke Company.
May 21.—Yorkshire Junior Gas Association.—Visit to the Keighley Gas-Works.
May 21.—Scottish Junior Gas Association (Eastern District).—Annual meeting in Edinburgh. Presidential address of Mr. M. Darling, of Cowdenbeath.
May 25.—Evening Star Lodge.—Meeting.
May 25.—Western Junior Gas Association.—Visit to the works of Messrs. Willey & Co., Ltd.
May 26.—Midland Association of Gas Engineers and Managers.—Spring meeting at Dudley.
May 26.—Society of British Gas Industries.—Annual general meeting and dinner, at the Hotel Cecil.
June 11.—London and Southern District Junior Gas Association.—Visit to the Margate Works of the Isle of Thanet Gas Light and Coke Company.
July 12.—National Gas Council.—Annual meeting.
Sept. 23.—Southern Association of Gas Engineers and Managers.—Visit to the Torquay Works of the Torquay and Paignton Gas Company.

Institution of Gas Engineers.

May 10.—Advisory Committee on Education.
May 11.—Emergency and Finance Committees.
May 11.—Benevolent Fund Committee of Management.
May 20.—Gas Investigation Committee.
June 13.—Council meeting.
June 14-17.—Annual General Meeting in London.

Jubilee of the Evening Star Lodge.—The Evening Star Lodge will celebrate their Jubilee at a meeting on Friday, Oct. 14.

North of England Gas Managers' Association.—The annual general meeting and jubilee celebration of the Association will take place to-morrow, at 12 o'clock, in the lecture theatre of the Institute of Mining and Mechanical Engineers, Newcastle-upon-Tyne. Mr. Herbert Lees, President of the Association, will take the chair, and will read his Presidential Address. At 1.30 there will be luncheon at the Central Station Hotel.

Cooling and Cleaning Plant at the Scunthorpe Gas-Works.—The issue of the "Engineer" dated April 29 contains an illustrated account of an unusual type of gas cooling and cleaning plant which has been installed at the Scunthorpe Gas-Works. The gas from the generators passes through a hydraulic seal into a gas collecting main, and from there direct to a Lymn cooler and cleaner. This is a static gas washer which has been used for some years on producer gas, though the Scunthorpe installation provides the first instance of its adoption for town gas cleaning purposes. It operates on the principle of utilizing the momentum of the upward flow of gas, sent in at the bottom of the cooling tower, to atomize liquid falling in thin sheets, admitted at the top of the tower, with resultant intimate contact between gases and liquid without the use of a mechanical spraying device or any other moving parts. On leaving the washer, the gas enters a centrifugal exhauster, in which the last traces of tar are removed by the addition of a small quantity of water. At present no ammonia is being recovered; but the plant is so arranged that a Power Gas Corporation ammonia absorber can be placed between the hydraulic main and the cooling and cleaning plant.

THE INSTITUTE OF FUEL.

Amalgamation of the Institution of Fuel Technology and the Institution of Fuel Economy Engineers.

A Joint Meeting of the Vice-Presidents and members of the Councils of the Institution of Fuel Technology and the Institution of Fuel Economy Engineers was held under the Chairmanship of Sir Alfred Mond at 37, Lowndes Square, S.W. 1, on Friday, April 29.

The following were present at the meeting: Sir Alfred Mond (President), Sir Hugo Hirst, Sir David Milne-Watson, Col. Sir William Smith, Prof. Harold B. Dixon, Prof. R. V. Wheeler, Sir William Larke (Chairman, Institution of Fuel Technology), Mr. P. C. Pope (Chairman, Institution of Fuel Economy Engineers), Messrs. G. R. Thursfield, F. A. Freeth, T. Barratt, A. W. A. Chivers, R. Lessing, John D. Troup, Sir Philip Dawson, Messrs. H. Tomlinson-Lee, John Bruce, J. Gander, T. Trimnell, W. M. Selvey, Edgar C. Evans, S. McEwen, W. A. Woodeson, E. W. L. Nicol, H. L. Pirie, L. C. Harvey, M. W. Travers, and T. Hardie.

As President of both Institutions, in November last Sir Alfred Mond, having found a general desire, both among those most closely associated with the problems of fuel economy and among those throughout the country who have a general interest in the question, that the two existing Institutions should be merged into one, suggested terms of fusion; and the following proposals were subsequently accepted by the Councils of both Institutions:

1.—That the name of the merged Institutions be "The Institute of Fuel."

2.—That the Councils of both Institutions as constituted at present be merged and form the Council of the Institute of Fuel, and that in the autumn following the inauguration of the Institute of Fuel, a new Council shall be elected by ballot of the members of the Institute.

3.—That the present Honorary Secretaries of each Institution be joint Honorary Secretaries of the Institute of Fuel.

At the meeting the final steps for the fusion of the existing Institutions and the inauguration of the Institute of Fuel were taken.

Sir ALFRED MOND expressed his great gratification that the fusion had been successfully accomplished, and thanked the Vice-Presidents, Chairmen, and members of the Councils of both Institutions for their co-operation in bringing about the present happy result. The essential importance of the problems connected with fuel economy and fuel technology to the future of British industry was becoming increasingly recognized. The Government were vitally interested in the subject, and had appointed a National Fuel and Power Committee, of which he had the honour to be Chairman, to investigate and consult upon the various problems in their many aspects. That Committee was progressing satisfactorily with its work; and it was of the utmost importance that there should be a unified Institution, important in numbers and personnel, to investigate, advise, and instruct the Committee and the community on these highly technical matters. From the readiness to co-operate which had already been shown, he felt that the Institute of Fuel was being inaugurated under the most favourable auspices. There had been many who had been waiting to join a unified Institute; and now doubtless they would all come forward to add strength and numbers to an Institution which was to play a great part in the future of British industrial expansion. He moved the formal resolutions to give effect to the fusion.

These were seconded by Sir HUGO HIRST, who said that, on account of the national importance of the subject and of the fact that it was essential that there should be one body to deal authoritatively with the problems of fuel technology, he was glad the fusion had been effected.

Sir WILLIAM LARKE proposed, and Sir PHILIP DAWSON seconded, the appointments of Mr. H. L. Pirie and Mr. Edgar C. Evans as Joint Honorary Secretaries of the Institute of Fuel.

This was carried unanimously.

PRESENTATION TO MR. J. H. SILLITOE.

A memorable gathering of chairmen, engineers, managers, and others connected with the gas industry, was held at the Midland Hotel, Manchester, on Tuesday, April 26, when a luncheon was given in honour of Mr. J. H. Sillitoe, the Hon. Secretary for the National Gas Council (Manchester District).

Alderman F. S. PHILLIPS (Chairman of the Salford Gas Committee) presided. The guests present were representatives of those gas undertakings participating in the Manchester District Coal Pool, 1926, for which Mr. J. H. Sillitoe had acted as Hon. Secretary during the extremely difficult nine months period of the coal strike. The following is a fairly full list of those who attended:

Ernest Hamer	Chairman	Blackburn
H. Curtis	Engineer	Macclesfield
J. Riley	Engineer	Cloughfold, Rossendale
E. Parry	Superintendent	Oldham
R. J. Finnemore	Representative "Evening Chronicle"	Manchester
Albert Hilton	Chairman	Middleton
T. Leaver	"Daily Dispatch"	Manchester
Frank Appleby	"Manchester Guardian"	Manchester
S. Reece	"City News"	Manchester
Peter J. Tomlinson	Chairman	Blackpool
William Bennett	Engineer	Mossley
P. R. A. Grieves	"Evening News"	Manchester
T. W. Smith	Manager	Whitworth
E. Howard	Manager	Longridge
James Fisher	Chairman	Longridge
George Briggs	Manager	Knutsford, Cheshire
F. W. Baber	"Gas Journal"	London
W. Whatmough	Engineer	Heywood
A. Halliwell	Manager	Littleborough
Robert J. McBeath	Chairman	Stretford
R. B. Braddock	Engineer	Radcliffe
Alderman Bradley	Chairman	Bury
H. Simmonds	Engineer	Bury
Joseph Hyde	Chairman	Westhoughton
J. Robinshaw	Manager	Westhoughton
J. W. Bottomley	Manager	Milnrow
M. Newsome	Manager	Chorley
Thomas Heald	Chairman	Chorley
Samuel Tagg	Engineer	Preston
A. Henshall		Manchester
George P. Mitchell	Engineer	Blackburn
J. Herbert Clegg	Engineer	Burnley
C. F. Witham	Chairman	Burnley
F. Pollard	Chairman	Oldham
William Hill	Engineer	Stalybridge
W. J. Smith	Engineer	Bolton
R. H. Holt	Chairman	Rochdale
H. Shewring	Engineer	Rochdale
W. W. Whiteside	Chairman	Clitheroe
R. Barrett	Engineer	Clitheroe
F. S. Phillips	Chairman	Salford
William Grundy	Chairman	Leigh
F. Bowen	Engineer	Leigh
T. Fairhurst	Deputy-Chairman	Altrincham
J. H. Rnft	Engineer	Lytham St. Annes
Joseph Townsley	Engineer	Ashton-under-Lyne
H. R. S. Williams	Engineer	Altrincham
Bernard Shaw	Chairman	Hollingworth
A. Gilmore	Manager	Hollingworth
Tom Cook	Chairman	Manchester
Francis H. King	Director	Whitworth
Wm. Cundiff	Deputy-Chairman	Manchester
T. Rowbotham	Chairman	Stockport
S. Meunier	Engineer and Manager	Stockport
J. H. Cadman	Assistant Secretary	Manchester
W. W. Woodward	Engineer	Salford
Thomas W. Barratt	Engineer	Morecambe
James C. Wilson	Chairman	Morecambe
C. T. Eachus	Chairman	Northwich
P. Welbourn	Manager	Northwich
H. C. Handley	Manager	Denton
George Harrison		Denton
I. Blakeley		Manchester
E. Brown		Manchester
William Rogerson	Engineer and Manager	Middleton
J. H. Chew	Engineer and Manager	Blackpool
W. A. Shovelton	"Gas World"	London

THE TOASTS.

The CHAIRMAN, proposing the toast of the day, said that the object of the gathering was to do honour to one for whom they all had the highest respect and esteem. All of them had had the privilege of consulting Mr. Sillitoe upon matters connected with the gas industry. Mr. Sillitoe, through the kindness of the Manchester Corporation Gas Committee, had practically found them all a home in the Manchester Town Hall, where they could hold their meetings; while at the same time he had also been allowed to act as the Secretary for the local branch of the National Gas Council. A more assiduous man in the discharge of the offices pertaining to that Secretaryship could not be conceived. He was friendly with everybody, and was ready and willing at all times to help them. They were therefore delighted to honour Mr. Sillitoe by inviting him to attend the luncheon. When, at the end of April last, a great misfortune fell upon the country in the stoppage of the coal industry, there was an opportunity for service. Mr. Sillitoe rose to that opportunity; and, instead of leaving them in their various localities to fight with the difficulties of getting supplies of coal when and where and how they could, he had the idea that by combining the requirements of the various undertakings, and dealing with them collectively, it would be much better for everybody, and incidentally save a great deal of money. He placed them in the position of being able to say: "We are ready to charter this, that, or the other boat, and take the whole cargo." The result was that cargoes of coal were much more easily secured, there was much more regularity about their dispatch, and great economies were effected in the prices paid. This was not a small achievement. If any undertaking got into a corner and showed signs of running-out of supplies, Mr. Sillitoe was able to make an adjustment by which those urgent requirements were met, and no one suffered. In that way, not far short of half-a-million tons of

coal were brought into the Lancashire district and distributed among the various gas undertakings. If he talked for a long time, it would not be possible to magnify the services rendered to them by Mr. Sillitoe. They acknowledged those services willingly; and the gathering which had assembled was evidence that the feeling was genuine. It was therefore proposed to present Mr. Sillitoe with an illuminated address of appreciation for his services, in order that he might have some memento in his home of the circumstances which had occurred in the past and the way in which they had been met by him.

THE ADDRESS.

Alderman Phillips then formally presented Mr. Sillitoe with the illuminated address, which read as follows:

To J. H. Sillitoe, Esq., Secretary, National Gas Council (Manchester District).

We, the representatives of the gas undertakings of the towns whose names are here inscribed, desire to place on record our high appreciation of the very valuable services rendered by you to these undertakings during the National Coal Stoppage, 1926.

The great organizing abilities you displayed during that emergency, and the energy and zeal with which you undertook the purchase and delivery of such large quantities of foreign coal, have won our sincere admiration.

We therefore beg you to accept the accompanying cheque as a small token of our esteem and regard, and as some slight acknowledgment for all the arduous work you so willingly undertook on our behalf.

It is our earnest hope that you may long retain your health and strength, and that the years to come may bring you every happiness and prosperity.

Signed on behalf of the representatives of the gas undertakings:

F. S. PHILLIPS,
GEO. P. MITCHELL,
W. J. SMITH,
SAMUEL TAGG,
W. W. WOODWARD.

Mr. S. TAGG, speaking on behalf of the technical officers of the gas undertakings represented, said it was a great pleasure to him to support the eloquent and gracious remarks from the Chair which had commended the toast to them. Those responsible for the administration of gas undertakings had never been faced with a greater responsibility than during the coal stoppage. The position was fraught with political differences. The duty, which was fulfilled without failure on the part of any gas undertaking in the country, was that of maintaining for the communities to whom they were responsible a supply of gaseous energy during that period. It was almost impossible to realize what would have been the effect upon the health and general order of the community if the undertakings had failed throughout a long period to maintain an adequate supply of gas. That responsibility was met in an exemplary manner, largely owing to the assistance which the National Gas Council received through the individual efforts of its local Secretary. Was it any wonder that they should desire to acknowledge those services? No proposal which had ever emanated from the Lancashire and Cheshire district had been received with more enthusiasm by the technical officers of the industry, and through them by the Committees or the Boards of Directors they served, than that some permanent record should be made of their appreciation of the services Mr. Sillitoe had rendered to them individually and to the undertakings for which they were responsible. Of course, this would not have been possible without the willing co-operation of the Committee Mr. Sillitoe served. It was not possible to overlook the assistance Mr. Sillitoe had received in his work from an extraordinarily able and efficient staff. Those present, as individual members of the Pool, had rung him up at the Manchester Town Hall at all convenient and inconvenient hours with urgent demands for coal. In addition, Mr. Sillitoe had spent a great deal of his time at the docks arranging for deliveries. Both he and his staff worked something like fifteen hours a day, yet everyone was always treated with courtesy, efficiency, and zeal, thus making the business side of the Pool arrangement a pleasure. All these services, of course, justified the ceremony of that day. Their duty to Mr. Sillitoe was, however, of longer standing than the coal strike of 1926. It was one of the legacies of the war that gas undertakings no longer remained on their own footing. No longer were they allowed to conduct their own business. The circumstances of the war and the post-war conditions of trade compelled gas undertakings to act, not as isolated units, but as members of one body. The great success which had attended the National Gas Council, which was formed to meet both war and post-war conditions, was in no small measure due to the efficiency, the great organizing ability, and the far-sighted acumen which Mr. Sillitoe possessed. In their own northern area, with, perhaps, one unfortunate exception, labour disturbances had been avoided. Rates of pay and conditions of employment and holidays had been settled amicably, and, he believed, with fairness and justice to both sides. As a member of the National Executive, he could say that there was no district similar in importance to the Manchester district which took less work to London. All differences were settled locally; they did not throw their burdens for settlement upon the national body. If those present at the luncheon had included all in their area who appreciated the services Mr. Sillitoe had rendered to the gas industry, there would have been a much larger assembly.

Mr. THOMAS FAIRHURST (Deputy Chairman of the Altrincham Gas Company) also spoke in appreciation of Mr. Sillitoe's services to the industry. They all regarded him as their guide, philosopher, and friend—in fact, he was a friend in need and a friend indeed. All through the coal stoppage, whenever the Altrincham Engineer approached him upon any difficulty, Mr. Sillitoe responded nobly. At one time the last coal they had on the works had gone into the retorts, and there was little or no prospect of a fresh supply forthcoming; but Mr. Sillitoe engaged an express train with a number of wagons, and deposited coal in the Altrincham siding in time to overcome the difficulty. The credit of Altrincham was saved. It was a great blessing that the Government did not interfere during that crisis. They had had sufficient experience of Government interference during the war to last them for a lifetime. If ever the Government attempted to interfere with coal again, he hoped that, as far as the gas industry was concerned, a petition would be immediately set on foot to appoint Mr. Sillitoe the Chief Controller of the district.

MR. SILLITOE'S ACKNOWLEDGMENT.

Mr. SILLITOE said that twelve months ago everybody was wondering what was going to happen, though he did not think anyone was much concerned. When the stoppage came, they all went on with a smile, hoping for the best; but as the second and third months passed, the smile gradually wore away. The Pool arrangement originated through a suggestion from the National Gas Council in London, and one simply took up the suggestion as a matter of duty, without any idea of where it was going to lead to. As time went on, foreign coal had to be bought. Even then, at first, although there were difficulties, they were not of an insuperable character; but later on everyone was in sore straits. He remembered spending the whole of one Sunday in an endeavour to ascertain the precise condition of affairs. So much coal had been ordered, and it was known, from the returns, how much would be required day by day. It was found that at the Ship Canal there was only being discharged half the quantity necessary. The following morning he approached the principal supplier, and together they interviewed Mr. Latimer (the Managing Director of the Ship Canal Company), to whom it was pointed out that 30,000 tons of coal had been held up in the canal for a week, and that if the rate of discharge was not doubled most of the sixty gas undertakings affected, who served a population of between 5 and 6 million people, would have to shut-down. From that time forward the rate of discharge was materially accelerated; but wagons were scarce. Eventually this also was remedied; and then came great congestion on the railways, who were the worst of all to deal with. One night a telegram was sent to every chief railway official they could think of: "Lancashire gas undertakings in desperate straits owing to congestion on the railways; immediate remedy imperative." From that time onward everyone, from the chief officials of the Ship Canal Company down to the men who discharged the coal, did the best they could for the gas undertakings; and a great debt of gratitude was due to them for what they had done. He deeply appreciated the honour which had been paid to him that day; but he could not have done what he had been privileged to do unless the Manchester Corporation Gas Committee—and particularly the Chairman and the Deputy Chairman—had reposed such great confidence and trust in him. When the purchase of foreign coal was mooted, he asked that a Committee should not be appointed. In normal times this would have been a bad policy; but in an emergency such as the coal stoppage he felt it was the right and proper course to take, and that it tended towards greater rapidity of action. He would always remember the present gathering, and would cherish the address to the end of his days.

Mr. ERNEST HAMER (Blackburn) proposed "The Manchester Corporation Gas Committee," to which the CHAIRMAN (Alderman Tom Cook) and the DEPUTY CHAIRMAN (Councillor W. Cunliff) responded.

Mr. P. J. TOMLINSON (Blackpool) moved a cordial vote of thanks to Alderman Phillips for presiding; and this was seconded by Alderman COOK, and carried with acclamation.

NATIONAL GAS COUNCIL.

South-Western District Executive Board Meeting.

The Annual Meeting of the South-Western District Executive Board of the National Gas Council was held at the offices of the Exeter Gas Light and Coke Company on Wednesday, April 27—Mr. G. HARDY HARRIS, of Exeter, in the chair.

The minutes of the last annual meeting, dated April 22, 1926, were read and confirmed.

The minutes of the meeting of the District Executive Board held on June 23, 1926, were read and confirmed.

The CHAIRMAN moved the adoption of the report of the Management Committee for the year ended March 31, 1927.

Mr. S. J. INGRAM seconded, and the report was adopted.

Mr. C. G. DAWSON proposed, and Mr. J. E. NORMAN seconded, that Mr. G. Hardy Harris be re-elected Chairman of the District Executive Board for the ensuing year.

The resolution was carried unanimously.

On the motion of Mr. G. HARDY HARRIS, seconded by Mr. W. E. DEAN, Mr. P. S. Hoyte (Plymouth) was unanimously re-elected Vice-Chairman of the District Executive Board.

The following were elected on the Management Committee: Messrs. J. Armstrong (Ilfracombe), J. R. Bradshaw (Plymouth Corporation), R. Bruford (Taunton), J. H. Cornish (Bridgwater), C. G. Dawson (Torquay and Paignton), W. E. Dean (Exmouth), S. E. Halliwell (Bristol), S. J. Ingram (Truro), J. E. Norman (Weston-super-Mare), W. N. Westlake (Exeter), J. W. Whimster (Bath), and T. H. Woodcock (Stroud).

Mr. J. E. NORMAN proposed, and Mr. C. G. DAWSON seconded, that Mr. W. N. Westlake (Exeter), who retires in rotation and is eligible for re-election, be re-elected one of the representatives on the Central Executive Board.

This was carried unanimously.

On the motion of Mr. G. HARDY HARRIS, seconded by Mr J. TAYLOR, it was unanimously resolved that Mr. E. H. Dar be re-elected Hon. Secretary for the coming year.

SOME OBSERVATIONS ON THE HYGROSCOPICITY OF BYE-PRODUCT SULPHATE OF AMMONIA, AND THE EFFECT THEREON OF THE PRESENCE OF TRACES OF PYRIDINE SULPHATE.

By J. MACLEOD, F.I.C., M.I.Chem.E., C. CHAPMAN, F.I.C., A.M.I.Chem.E, and T. A. WILSON, F.I.C., A.R.T.C.

[The authors state that the presence of pyridine sulphate—even in minute quantities—on the face of ammonium sulphate crystals, raises the hygroscopicity of the salt. To minimize the effect, they suggest that the sulphate crystals should be dried in the presence of free ammonia. As for the containers used to store and transport the sulphate, these have little or no effect on its hygroscopicity.]

It was noted that the sulphate of ammonia produced, bagged, and stored at each of two of the works of the Glasgow Corporation Chemical Works Department—Provan Works and Dalmarnock Works—showed widely differing moisture contents, even though the same type of drier was used in each case. In the Provan Works sulphate store it was further noted that on certain days moisture condensed in the form of beads on the outside of the bags, and that if, after this condition appeared, dry weather prevailed for a day or two, this moisture disappeared, leaving a thin film of material which on being rubbed with the finger left a white mark on the surface of the bag. This phenomenon did not appear with Dalmarnock Works produced sulphate in the Dalmarnock store. It was decided to investigate the cause of the greater moisture content in Provan sulphate; and it was hoped that the results of this work might throw some light on the other phenomenon.

For this purpose, average samples of Provan and of Dalmarnock sulphate were obtained, and were dried for seven days in an electric oven at 105° C. Four wide-mouthed stoppered bottles were cleaned and thoroughly dried, and the dried sulphate samples were halved, and placed in these bottles. One bottle of each dry sample was then sent to each of the works concerned.

In the examination, 5 grammes of each sample were placed in a silica basin approximately 3 in. in diameter and ½ in. deep, and the basin was then placed in a position at least 8 ft. high—to avoid accidental disturbance by passing workmen—on a shelf or on piled-up bags of ammonium sulphate. To prevent the entrance of dust or adventitious moisture, the basin was covered by a 6 in. diameter clock glass, supported at a little distance above the basin on three corks. In this way there were distributed in the sulphate stores at the Dalmarnock and the Provan Works five sets each of two samples—one of Dalmarnock sulphate and one of Provan sulphate. These were so placed as to ensure that each set would in each store be under conditions different from the others in respect of proximity to open doors, to walls, or to sources of heat, &c. During the period of the test, sulphate was dispatched from the Provan store, with the result that the three sets of samples placed on piled sulphate bags had to be removed. They were then placed on top of up-ended drums at a height of about 3 ft. from the floor level, in positions which, except for height, were approximately the same as they formerly held.

The samples were weighed every morning (Sundays excepted) at 10 a.m., and the readings on wet and dry bulb thermometers were taken at 10 a.m., 12 noon, 2 p.m., and 4 p.m. each day. The position of this instrument was changed daily after the 10 a.m. reading. During the first 24 hours it was placed beside No. 1 set of samples, then beside No. 2 set, and so on, passing from No. 5 set to No. 1 again.

TABLE I.—*Percentage Gain in Weight of Samples Exposed in Provan Works Store.*

After Days.	Provan Sulphate. Position.					Dalmarnock Sulphate. Position.				
	1.	2.	3.	4.	5.	1.	2.	3.	4.	5.
1	9·51	0·023	4·14	0·89	6·06	8·29	0·77	7 14	2·34	5·56
2	9·51	0·014	1·016	0·238	6·476	6·89	0·316	2·724	0·738	6·032
4	12·71	0·21	0·59	0·85	12·64	9·99	0·58	2·42	2·35	10·60
5	4·55	0·10	0·23	0·06	6·69	3·05	0·36	0·68	0·62	5·71
6	3·78	0·31	0·03	3·13	3·24	1·81	0·42	0·89	3·37	3·57
7	11 52	0·104	3·012	12·372	11·154	9·104	0·568	3·116	10·89	8·984
8	28·26	0·856	9·96	26·940	28·002	21·028	0·668	9·406	23·544	19·176
9	37·044	0·208	14·92	34·51	40·05	27·38	0·488	13·608	31·624	25·608
11	39·06	0·188	12·574	36·60	43·14	38·224	0·408	9·992	31·442	37·22
12	36·41	0·23	7·58	31·21	40·77	25 26	0·52	4·94	27 66	25·45
13	30·48	0·27	1 03	23·87	31·77	19·41	0·52	0·46	19·47	21·69

TABLE II —*Percentage Gain in Weight of Samples Exposed in Dalmarnock Works Store.*

After Days.	Provan Sulphate. Position.					Dalmarnock Sulphate. Position.				
	1.	2.	3.	4.	5.	1.	2.	3.	4.	5.
1	0·056	0·012	0·024	0·066	0·058	0·074	0·144	0·064	0·166	0·166
2	0·056	0·074	0·316	0·066	0·131	0·074	0·180	0·118	0·240	0·148
4	0·056	0·094	0·324	0·072	0·162	0·074	0·188	0·142	0·150	0·162
5	0·074	0·094	0·336	0·102	0·188	0·092	0·188	0·184	0·188	0·182
6	0·074	0·094	0·496	0·412	0·214	0·092	0·188	0·356	0·302	0·212
7	0·074	0·108	0·582	0·472	0·248	0·086	0·196	0·338	0·302	0·230
8	0·074	0·136	0·582	0·472	0·264	0·088	0·200	0·338	0·302	0·242
9	0·074	0·160	0·582	0·472	0·282	0·088	0·200	0·338	0·302	0·274
11	0·074	0·160	0·582	0·472	0·282	0·088	0·200	0·338	0·302	0·274
12	0·060	0·136	0·522	0·462	0·312	0·060	0·212	0·280	0·320	0·246
13	0·066	0·144	0·564	0·464	0·308	0·070	0·200	0·304	0·320	0·262

The percentage gain in weight is shown in the following tables; Table I. giving results obtained at the Provan Works, and Table II. comparative results from the Dalmarnock Works.

The average percentage of saturation as shown by the wet and dry bulb thermometers was, during the period covered by the test, 77·5 p.ct. at Dalmarnock and 79·7 p.ct. at the Provan Works. The maximum recorded temperatures were:

Dry bulb . . Provan, 52·2° Fahr. .. Dalmarnock, 76·0° Fahr.
Wet bulb . . Provan, 51·0° Fahr. .. Dalmarnock, 68·0° Fahr.

The minimum recorded temperatures were:

Dry bulb . . Provan, 35·0° Fahr. .. Dalmarnock, 39·0° Fahr.
Wet bulb . . Provan, 34·0° Fahr. .. Dalmarnock, 38·5° Fahr.

These figures show that the conditions existing in the Dalmarnock Works store were entirely different from those in the Provan store, since, in the case of both the maximum and minimum temperatures, Dalmarnock was higher by 23·5° Fahr. and 4° Fahr. respectively. The differences between the minimum and maximum temperatures—17·5° Fahr. in the case of Provan, and 37° Fahr. in the case of Dalmarnock—show that the store in the latter works has a wider range of temperature on a higher level than that existing at Provan.

From a consideration of the figures in Tables I. and II., it is obvious that, while a difference in composition of the sulphate produced commercially at the two works may account for a difference in hygroscopicity, this is by no means an important factor bearing on the effect produced at Provan. Examination of the premises seemed to show that the different results obtained at the two works were due:

(*a*) Chiefly to different conditions existing in the two stores, due to a large amount of steam from external sources entering the store at Provan.

Added to this, the figures given show:

(*b*) A higher percentage saturation of the atmosphere in Provan (due in large part to the entry of external steam, as mentioned above).

(*c*) A lower temperature existing over a larger area of the store at Provan, thus tending to condensation and retention of moisture.

This is borne out by an examination of figs. 1 and 2, and to a lesser extent to the fact that:

(*d*) Provan sulphate, while in the dry state, absorbs moisture initially more rapidly, and retains such absorbed moisture more tenaciously, than does Dalmarnock sulphate. This, it was considered, might be due to the presence of some impurity in Provan sulphate in larger amount than in Dalmarnock sulphate, and led to the examination of the effect of the presence of pyridine sulphate on the hygroscopicity of ammonium sulphate.

The first three causes given above as contributing to the effect produced at the Provan Works could not easily be removed. It happens that the main doors (five in number) giving access to the railway loading bank are all situated on one side of the building, and that on that side of the store, directly to windward and within 30 yards of the store, is the cooling maze for the spent liquor discharged from the ammonia stills. This was the main source of external steam entering the store; and its deleterious effect was somewhat mitigated by keeping all these doors, or as many as possible, closed, except where actual access to the loading bank was necessary.

It was considered probable that the difference in value obtained as between the Provan and Dalmarnock samples in the same set might be due to variations in the amount of impurities present, especially when bearing in mind that the liquor from which the sulphate is produced is not the same in each case. That distilled at Provan is the ammoniacal liquor from the carbonization of coal in Woodall-Duckham vertical retorts. At the Dalmarnock Works, however, the retorts are Wilson verticals; and as the whole of the gas produced at Dalmarnock is subjected to acid washing, a proportion (about 5 p.ct.) of the make of ammonium sulphate at the Dalmarnock Chemical Works is from the gas washing plant. This, of course, arrives as ammonium sulphate, and is mixed with the mother liquor. There is yet another difference in operating practice between the two works. At Dalmarnock, an open-type saturator is em-

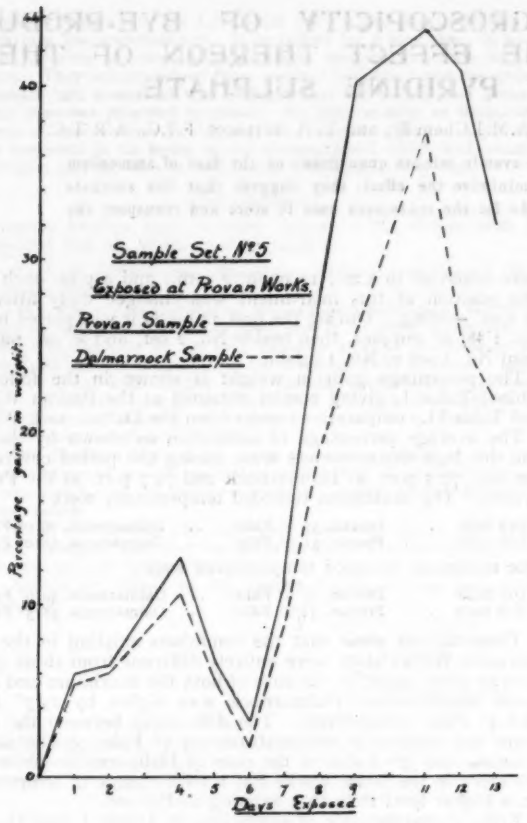


Fig. 1.

ployed, the three cracker pipes entering at the open front of the vessel, and passing under the curtain to the back; whereas at Provan the cracker pipes enter the vessel at the back and pass towards the front.

It was thought that, made under these conditions, Dalmarnock sulphate might contain less pyridine sulphate than that produced at Provan. It was therefore decided to examine this possibility, and the effect of the presence of pyridine sulphate on the hygroscopicity of ammonium sulphate. It was presumed that the pyridine sulphate, if present, was in the form of a film on the surface of the individual crystals of ammonium sulphate, and that this film was composed of adhering mother liquor when the crystals were removed from the saturator. Owing to the fact that pyridine sulphate is considerably dissociated on heating, it was obvious that the amount adhering to the dry crystal would be considerably less than that present after leaving the centrifugal hydro-extractor, and also that the effect, if any, on the hygroscopicity might be due not to the pyridine sulphate itself, but to the residual free sulphuric acid from the dissociation of the pyridine sulphate while passing through the drier.

Several methods of estimating pyridine were tried, but not one was found to give concordant results with small quantities of pyridine—such quantities as would presumably be present associated with (say) 5 grammes of commercial ammonium sulphate. It was therefore decided to determine the pyridine content of a strong solution of pyridine sulphate, and to add this to pyridine-free ammonium sulphate in quantities calculated to give the desired concentration of pyridine sulphate. Two methods of estimating the pyridine sulphate solution strength were used—the first that of Spacu and Creanga*; the results obtained being checked by the method of Maurice Francois†. In calculating the requisite amount of pyridine sulphate solution to add to the pyridine-free ammonium sulphate, allowance had to be made for the loss of pyridine by dissociation during the evaporation of the solution and subsequent drying of the salt. This was done by determining the loss on treating 100 grammes of sulphate in the same way as the 5 grammes were treated, and presuming that the loss in the latter case would be in the same ratio. This would most probably give erroneous results; but in the absence of any knowledge of a method whereby small quantities of pyridine could be accurately determined was the only way available. The percentage values of pyridine sulphate given subsequently should therefore not be regarded as reliable figures; but the ratios between the various pyridine contents may be accepted as reasonably close.

Having ascertained the pyridine sulphate content of the strong solution and the loss by dissociation on evaporation and drying,

* Zentralblatt, 1924 (2), p. 2777.

† Comptes Rendus, 1903, July-December, p. 324.

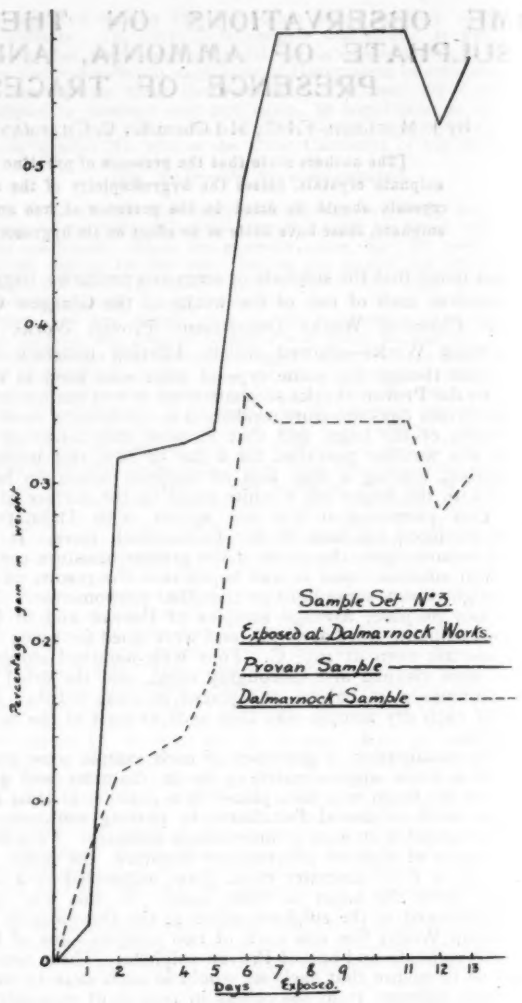


Fig. 2.

the calculated amounts to give final concentrations of 0·06 and 0·098 p.ct. of pyridine sulphate were added to 5 grammes of pyridine-free ammonium sulphate crystals. The liquid was intimately mixed with the crystals, and the whole dried on the water-bath, and finally in the electric oven at 105° C. These samples, together with 5 grammes of the pyridine-free ammonium sulphate crystals as a comparative standard, were then exposed in position No. 1 in the Provan store. The results obtained are shown in Table III., and graphically in fig. 3.

TABLE III.—*Percentage Gain in Weight of Pyridine-Sulphate Contaminated Samples of Ammonium Sulphate.*

P.Ct. Pyridine Sulphate Present.	After Exposure for—				
	1 Day.	2 Days.	3 Days.	4 Days.	6 Days.
Nil	0·74	11·98	18 08	26·44	52·97
0·06	6·66	41·67	54·74	75·64	125·14
0·098	12·68	60·30	84·86	107·82	..

From these results it was obvious that the presence of pyridine sulphate as an impurity had a decided effect on the hygroscopicity of ammonium sulphate; and further experiments were carried out using smaller quantities of pyridine sulphate as adulterant. The results thus obtained are given in Tables IV. and V., and are shown graphically in figs. 4 and 5.

These results indicate that, present even in traces only, pyridine sulphate has a very large effect on the moisture-absorbing capacity of ammonium sulphate.

A further experiment was carried out to check whether the presence of the pyridine sulphate was the determining cause of this effect. The same volume of pyridine sulphate solution was added to each of two quantities of 5 grammes of pyridine-free ammonium sulphate. Both were dried on the water bath, but the final drying was in one case carried out by drying in the electric oven at 105° C., and in the other by passing through the sample a mixture, heated to 105° C., of dried air and dried ammonia gas, the object being to replace any pyridine present by ammonia, and to neutralize any free sulphuric acid remaining from the dissociation and decomposition of pyridine sul-

TABLE IV.—*Percentage Gain in Weight of Pyridine-Sulphate Contaminated Samples of Ammonium Sulphate.*

P.Ct. Pyridine-Sulphate Present.	After Exposure for—											
	1 Day.	2 Days.	4 Days.	5 Days.	6 Days.	7 Days.	8 Days.	10 Days.	11 Days.	12 Days.	13 Days.	14 Days.
Nil	5·27	34·06	47·09	59·48	63·58	67·04	68·80	65·95	67·23	62·39	51·98	55·45
0·006	42·65	69·46	94·69	111·98	119·15	125·96	134·67	134·60	142·27.	132 60	113·23	120·65

TABLE V.—*Percentage Gain in Weight of Pyridine Sulphate Contaminated Samples of Ammonium Sulphate.*

P.Ct. Pyridine-Sulphate Present.	After Exposure for—														
	1 Day.	2 Days.	3 Days.	5 Days.	6 Days.	7 Days.	8 Days.	9 Days.	10 Days.	12 Days.	13 Days.	14 Days.	15 Days.	16 Days.	19 Days.	20 Days.
Nil	4·92	7·75	8·65	7·52	8·42	5·82	1·32	4·33	7·45	20·67	33·17	33·87	33·31	24·01	11·77	9·56
0·0012 .	7·57	10·79	15·39	14·22	17·11	12·77	5·08	8·74	13·86	27·33	38·15	38·64	38·17	..	..	..
0·0024 .	10·13	16·40	20 13	22·07	23·53	19·45	10·27	15·32	21·60	37·51	49·82	50·26	49·19	36·71	15 50	13·15
0·0048 .	14·44	23·79	33·41	34·51	43·59	36·79	22·48	29·19	38 77	60·51	74·94	75·07	73·66	56·54	28·50	28·90

phate. These samples, together with 5 grammes of pyridine-free ammonium sulphate crystals, were then exposed in the same position, and under the previously existing conditions, in the Provan sulphate store. The results obtained are shown in Table VI. and fig. 6.

From these results it would follow that drying the commercial salt in a current of hot dry air containing dry ammonia gas would reduce the hygroscopicity considerably.

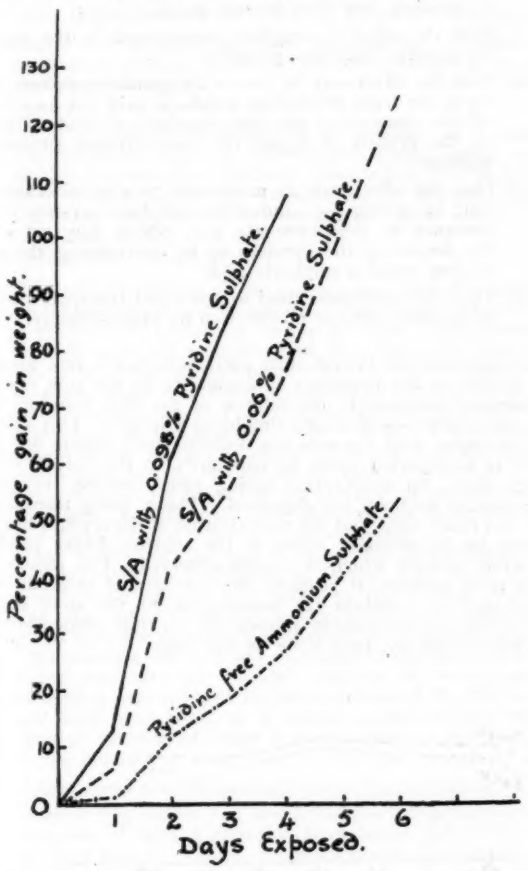

Percentage gain in weight.
S/A with 0·098% Pyridine Sulphate.
S/A with 0·06% Pyridine Sulphate.
Pyridine free Ammonium Sulphate.
Days Exposed.

Fig. 3.

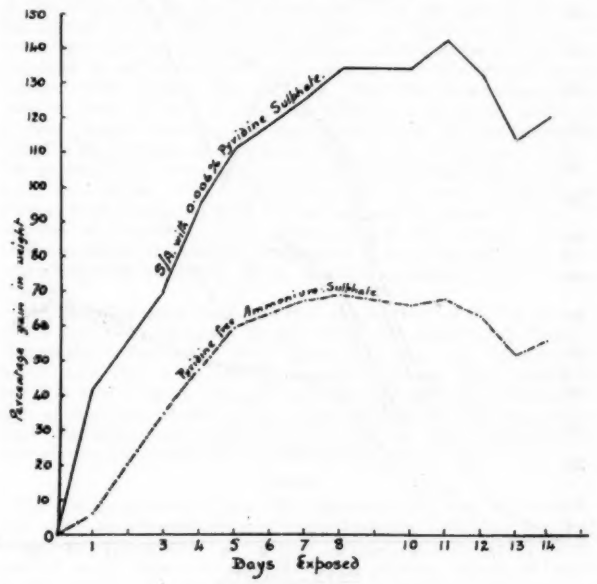


Fig. 4.

To test the effect (if any) of the action of jute containers, samples were cut from an "inner" and from an "outer" jute bag, and dried in the electric oven until constant in weight. These were then exposed in the same manner as the samples of sulphate of ammonia had been; and the results obtained are recorded in Table VII. and fig. 7.

The results of these investigations show:

(1) That the presence of pyridine sulphate as an impurity on the face of ammonium sulphate crystals raises considerably the hygroscopicity of that salt.

TABLE VI.

Nature of Sample.	Percentage Gain in Weight after Exposure for—											
	1 Day.	2 Days.	4 Days.	5 Days.	6 Days.	7 Days.	8 Days.	9 Days.	11 Days.	12 Days.	13 Days.	14 Days.
Standard sulphate of ammonia . . .	0·02	2·97	21·99	39·29	64·59	73·53	79·92	59·28	94·05	102·59	109·72	105·75
NH_3-dried sample .	0·08	0·83	10 72	22·47	37·63	41·27	42·94	28 97	49·07	55 62	61 12	58·45
Air-dried sample .	4·14	10·54	41·12	66·09	101·28	114·08	122·36	95·27	142·66	149·75	154·15	147·10

TABLE VII.

Nature of Sample.	Percentage Gain in Weight after Exposure for—												
	1 Day.	2 Days.	4 Days.	5 Days.	6 Days.	7 Days.	8 Days.	9 Days.	11 Days.	12 Days.	13 Days.	14 Days.	15 Days.
Outer jute sack .	16·45	15·39	20·88	20·93	19·17	17·09	16·06	20·19	20·92	21·90	19·09	18·20	18·92
Inner jute sack .	13·71	12·78	19·10	18·81	17·17	15·57	13·63	18·17	19·56	20·67	17·61	15·92	16·74

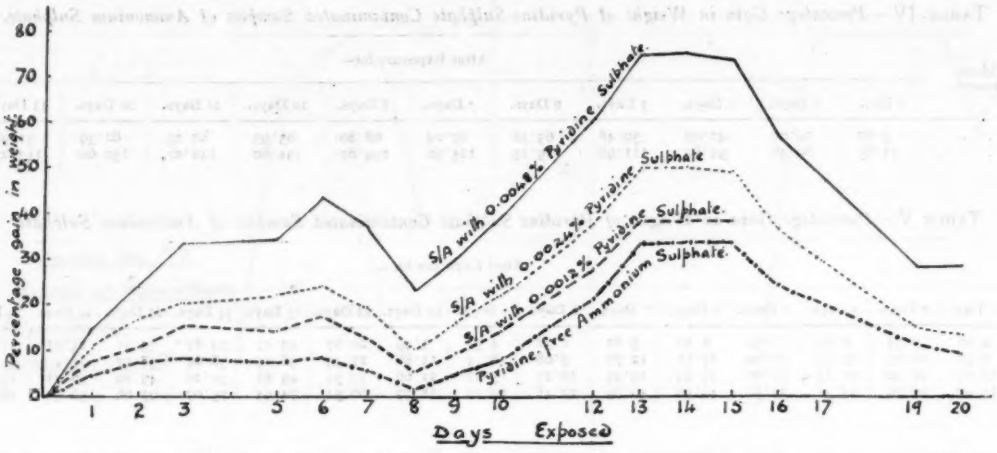


FIG. 5.

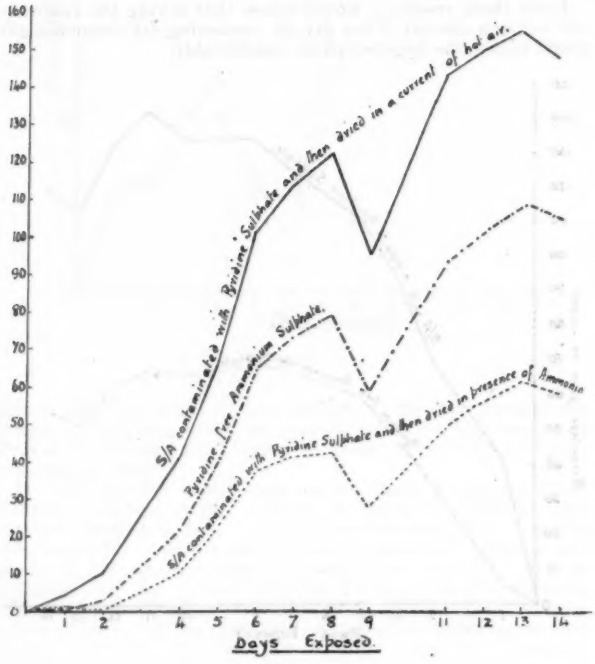

S/A contaminated with Pyridine Sulphate and then dried in a current of hot air.
Pyridine-free Ammonium Sulphate.
S/A contaminated with Pyridine Sulphate and then dried in presence of Ammonia
Days Exposed.

Fig. 6.

(2) That the amount of pyridine sulphate present necessary to produce this effect is very small.

(3) That the effect is roughly proportional to the amount of pyridine sulphate present.

(4) That the effect may be due to the pyridine sulphate itself or to the trace of residual sulphuric acid left as a result of the dissociation and decomposition of that substance in the process of drying the contaminated ammonium sulphate.

(5) That the effect can be minimized to a considerable extent by drying the ammonium sulphate crystals in the presence of free ammonia gas, which may act either by displacing the pyridine or by neutralizing the trace of free residual sulphuric acid.

(6) That the containers used to store and transport the sulphate have little or no effect on its hygroscopicity.

In regard to the Provan store phenomenon, it is now assumed to be due to the transport by capillarity by the jute fibres of condensed moisture to the interior of the bag, forming there a concentrated solution of ammonium sulphate. This solution intermingles with the entering moisture, and during dry weather is transported again by capillarity to the outside of the bag, when, on evaporation taking place, minute crystals of ammonium sulphate are deposited. These, being transparent, are not easily seen; but the pulverization of the crystals brought about by the abrasive action of the rubbing finger produces a white powder which is readily observed. The remedy for this is to prevent, if possible, the entrance of external moisture, and to maintain the temperature of the store slightly above that of the outside atmosphere, so that condensation of moisture may not take place on the bags.

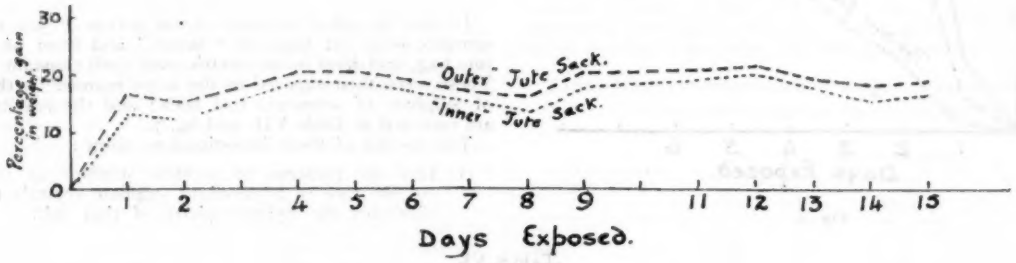


FIG. 7.

THE MECHANISM OF COKING.

As briefly mentioned in a paragraph last week, Audibert and L. Delmas discuss this subject in a lengthy paper in the Revue de l'Industrie Minérale (1927, p. 1). They summarize their conclusions as follows: When coal is heated it softens after a time; and since the chemical reactions induced by such heating transfer the fusible constituents into more refractory products, the softening or fusion is only transient, and the coal eventually regains its solid form. The progress of this change depends essentially on the nature of the coal and on the rate at which the temperature rises, starting from the instant when the pyrogenetic decompositions begin. Generally, the greater the rate of heating, the greater the maximum fluidity value. Considering the case of a coke-oven charge—where the particles composing it are separated by voids forming collectively a network of passages communicating between the interior and exterior—when the coal fuses, the substance of the particles flows slowly into the voids, and progressively blocks them; the particles eventually fusing together into a compact mass. This fusing together is necessary for the cohesion of the coke. If it is carried too far, so that the interspaces become obstructed, the volatile matter can only reach the outside by forcing its way, in bubbles, through the fused mass. When the mass finally hardens, some of the bubbles still remain; and the coke then has a porous and weak structure.

A coke of satisfactory "elementary" strength (*i.e.*, one that does not crumble under pressure) requires that the filling of the voids during the plastic stage shall be sufficiently nearly complete, but without giving the maximum compactness; and to allow of this there must be a suitable relationship between the nature of the coal, the rate of heating allowed by the oven, the average size of the particles, and the closeness of packing.

The comparative non-success of methods for measuring coking or agglutinating power is due to the fact that up to the present the important influence of the rate of heating on the viscosity of the softened coal has not been realized. This factor can be determined very aptly in coke-ovens by making accurate and complete the present incomplete knowledge of the temperature conditions allowed by the usual types of such ovens.

PROGRESS OF PHOTOMETRY.

Visit of the Illuminating Engineering Society to the National Physical Laboratory.

Twenty years ago comparatively little interest was taken in the important subject of photometry—the measurement of light. In view of the present widespread appreciation of the value of adequate illumination, this certainly seems astonishing; for the influence of light on health, personal safety, and commercial efficiency is very great indeed. This comparison must have been uppermost in the minds of at any rate the older members of the Illuminating Engineering Society on Tuesday, April 26, when the Society inspected the Photometry Department of the National Physical Laboratory. As it exists to-day, the "N.P.L." is wonderfully equipped for dealing with all manner of problems—both "pure" and applied—in connection with lighting. About sixty members of the Society participated in the tour of inspection. For this purpose they were divided into small groups, in charge of guides who spared no pains to make the visit interesting, and who were ever ready to answer queries.

Wide Range of Work.

Briefly, four different types of work are carried out in the Photometry Department of the National Physical Laboratory:

1. Maintenance of standards, and fundamental problems of photometry arising from the general problem of maintenance of standards.
2. Test work.
3. Special investigations arising from requests of outside organizations, such as Government Departments, the British Engineering Standards Association, the Illumination Committee of the Department of Scientific and Industrial Research, the International Commission on Illumination, &c.
4. Miscellaneous investigations.

The first work explained to the visitors was that of measuring the total light given out by a lamp. For this purpose some form of photometric integrator has to be used. This instrument depends upon the principle that if a source of light is placed inside a hollow sphere coated with a perfectly diffusing material, the brightness of the spherical surface due to reflected light is uniform all over, and proportional to the mean spherical candle-power of the source. The "N.P.L." has three integrators working on this principle. The first is in the form of a 2-metre cube, which, though not so sound theoretically as the sphere, gives correct results in comparisons of sources having similar light distributions. The other two are spheres—one 1 metre in diameter, the other 19 ft. in diameter.

The main portion of the test work of the Department is concerned with the standardization of lamps, both flame and electric; and much interest was taken by the visitors in the section of the laboratories where this work is undertaken. Tests on gas lamps with incandescent mantles include measurement of the pressure, the rate of consumption, and the calorific value of the gas. Mr. H. Buckley, who at the subsequent business meeting read a paper on the activities of the Department, and who also acted as a guide, explained that the standardization of gasfilled lamps is not at present carried out, owing to the liability of these lamps to behave irregularly.

New Apparatus for Determination of Polar Curves.

Keen interest was shown in a new apparatus for determining the polar curves of light distribution from lamps and fittings, including street lamps. In this, the employment of a rotating mirror, in which the source under test can be viewed at all angles of azimuth, gets rid of the necessity for moving the source itself.

Experiments are now being carried out in the laboratory with a specially-designed carbon-tube vacuum furnace. This is to be employed to investigate the possibility of using a black body as a primary standard of light by determining its candle-power per unit area at a definite temperature, such as the melting-point of platinum. The use of a black body radiator as the primary standard has often been suggested. Recent work in America and France has shown that for particular types of black body there seems to be considerable possibility of success in the suggestion. The unit of candle-power would not be affected by this work, as the standard would be defined in terms of the old unit—the international candle.

Reflection from Road Surfaces.

The brightness of road surfaces when illuminated and viewed at oblique incidence, where most surfaces tend to have a certain amount of specular reflection, is of importance in considering problems of street lighting. The visitors were able to see the apparatus used for investigating the reflective properties of various road surfaces. Present results, it was explained, indicate that the brightness of the road surface is determined mainly by the total candle-power of the source illuminating it, and not by its intrinsic brightness. For many surfaces, particularly after a period of wear, the brightness, when viewed at low angles, is much greater than that which would be found by calculation from the illumination on the assumption that the road was a perfect diffuser.

Business Meeting.

Following the tour of inspection, the visitors were entertained at tea; and after this a business meeting was held under the chairmanship of Mr. A. Blok.

It was at this stage that Mr. H. Buckley, M.Sc., F.Inst.P., presented the paper to which reference has already been made. This was entitled "The Work of the Photometry Department of the National Physical Laboratory." In the course of this the author mentioned that comparison of lights of the same colour presents no serious difficulties, and the same results are obtained by all observers irrespective of any abnormalities of colour vision which they exhibit. For the heterochromatic case, at least so far as concerns differences in colour between carbon lamps operating at the same colour as the pentane lamp, and tungsten lamps operating at 1·5 watts per candle, the problem has been dealt with by dividing the colour difference into steps. The laboratory has six sets of standard lamps, each compared with the set nearest in colour to it by a number of observers. It is assumed that the average results of the number of observers concerned in building-up these sets reproduces the behaviour of an observer possessing the "average eye."

Mr. Buckley went on to say that the method of flicker photometry has been proposed to deal with the problem of heterochromatic photometry. Here again, however, the difficulty of being sure that a group of observers possess the "average eye" is still present, though the most conspicuous difficulty—that of deciding when two juxtaposed fields of different colour have the same brightness—is eliminated. It is proposed to investigate the possibilities of the flicker photometer.

Glare.

On the question of glare, Mr. Buckley said that in connection with an investigation of street-lighting problems for the Illumination Research Committee, some experiments have been carried out to determine the effect of a glaring source of light on the ability of the eye to perceive brightness differences. The brightness difference threshold, or least difference of brightness between two adjacent fields which can be detected by the eye, serves as a measure of this ability; and the present work consists in the determination of the difference thresholds under various conditions of glare.

In making the measurements, the observer looks through a rectangular aperture into a totally-enclosed blackened cabinet. Directly opposite the observer's eyes a square aperture discloses a whitened screen. Under "absence of glare" conditions this field is uniformly bright, except in the centre, where arrangements have been made for varying the brightness of a small circular spot, so that it is either brighter or darker than the surrounding field. Under "glare conditions" the square field includes, in addition to the central test spot, a circular "glare" spot of variable candle-power.

For a given field brightness and for a given position and intensity of the glare spot, the observer is called upon to judge whether the central test spot is just brighter or just darker than the "main" field. Measurements of the brightnesses of the two fields then enable the brightness difference threshold (or Fechner fraction, as it has been called) to be determined.

A good deal of work has been done to determine the degree of precision with which an observer repeats his values from day to day. Work is now in progress to determine the effect of variations in both the intensity of the glare spot and its angular separation from the test spot.

Forthcoming German Exhibition.—As already announced in the "JOURNAL," an exhibition on a large scale—the fifth of an annual series—is to be held at Essen from June 7 to June 19 next, in connection with chemical manufacturing apparatus and machinery of all kinds. It is to be known by the name "Achema," and the promoters have sent us an "Achema Almanac," which describes in considerable detail the objects and scope of the exhibition, and contains much other useful information for those interested in the subject. Copies can be obtained from "Achema," Seelze bei Hannover, free until June 1, after which they will be charged 10 mks. per copy, if any are still available. Further details of exhibition space can also be had from the same address. As a representative display of the German chemical manufacturing industry, the "Achema" will no doubt prove highly interesting to those who are able to visit it in June.

"KEITH" PATENT THERMOSTAT GAS CONTROLLER.

Where gas heating is concerned, the advantages are becoming more fully realized of being able to maintain a given temperature, either in a liquid or in the gases of a chamber, by means of automatic control arrangements. A very up-to-date and successful apparatus of this nature is that known as the "Keith" patent thermostat gas controller.

This is a device comprising two main parts—the thermostat proper, which is immersed in the liquid or the air, the temperature of which has to be controlled, and the gas controller itself. The apparatus is suitable for use with gas at ordinary main pressure or for high pressure; larger quantities of gas, of course, being dealt with at higher pressure than is possible under low-pressure conditions.

The standard thermostat and governor is suitable for hot air or gases up to 700° Fahr., or water up to 220° Fahr.; and in some cases air or gas temperatures up to 900° Fahr. are dealt with. Varying gas consumptions can be arranged for up to (say) 2000 c.ft. per hour, under high-pressure conditions; the size of governor necessary being dependent upon the amount of gas required to be consumed.

Figs. 1 and 2 are diagrammatic illustrations of the application of the invention. The controller is connected from the point marked A by a copper tube to the point marked A on the thermostat; another tube being led from the point marked B on the thermostat to a position near the burner head, so that the small leak of gas passing from the cock C may be usefully consumed. D is a screw on the cover of the controller, by means of which the flame from the tube may be adjusted.

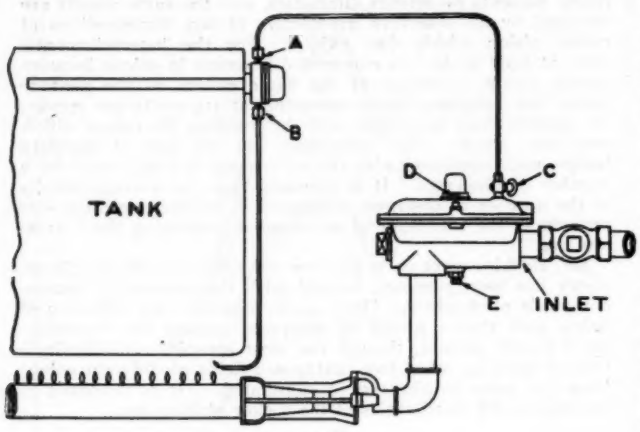


FIG. 1

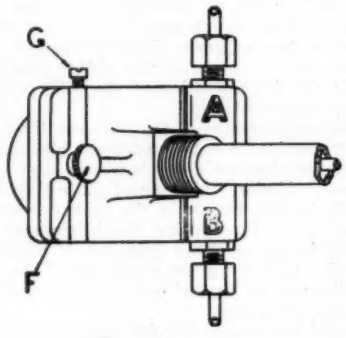


FIG. 2

If everything is correct, gas will pass to the main burners when the cock C is opened. When it is closed, the supply to the main burners will shut off. It should take about 15 seconds from the closing of the cock C for the valve to operate. The screw E is so adjusted as to prevent the burners being completely extinguished when the cock C is closed.

After setting the by-pass leak, the cock C is turned on, and the burners are allowed to heat the liquid to the required temperature. This attained, the milled-head screw F on the thermostat is adjusted, until the gas just shuts-down to the minimum. When this occurs, the gas jet from B goes out, or nearly so. After the adjustment has been verified, the screw F can be locked by the small set-screw G, and will need alteration only if the temperature of the operation requires to be changed. After the first setting, the cock C should be left open, and not touched.

In certain cases where it is desired to vary the temperature from time to time, the thermostat proper is fitted with a graduated dial, the turning of which to the pre-determined temperature required and indicated on the dial ensures that this temperature, when reached, will not be exceeded, and will be held within (say) 3° up or down.

A further development for comparatively small volumes of gas is the "Keith" direct type of thermostat—that is to say, without a governor. This has a capacity up to 50 c.ft. of gas per hour, and is suitable for liquid or gas temperatures up to 212°.

RELATIVE VALUE OF MILD STEEL AND HIGH TENSILE STEEL IN REINFORCED CONCRETE.

Outline of a Controversy.

The Weston Concrete Engineering Company, Ltd., of West Norwood, S.E. 27, have published a booklet entitled "The Relative Value of Mild Steel and High Tensile Steel in Reinforced Concrete Construction." It contains the correspondence between H. Weston and the Ministry of Transport during eight months commencing in September, 1925, and the reports of several experts on the subject.

The "war of the concrete" commenced on Sept. 11, 1925, when Mr. Weston wrote a letter to the Ministry of Transport, in which he asked them why it was that the Ministry allowed one quality of steel to be stressed to 24,000 lbs. per sq. in. and another to 16,000 lbs. per sq. in. for the same section in each case. In reply to this letter, the Ministry of Transport forwarded to Mr. Weston a copy of a clause which was incorporated in the specification for the special road contracts which were then being undertaken. This stated that "steel reinforcement may be either of rolled steel with a yield point of not less than 32,000 lbs. per sq. in., or of high tensile steel with a yield point of not less than 72,000 lbs." On this basis, the comparative equivalent weights of rolled high tensile steel would be 10 lbs. of rolled steel per sq. yd., and 6·66 lbs. of high tension steel per sq. yd.

Mr. Weston thereupon asked the Ministry of Transport how they came to the foregoing conclusion. In answer to this query he received a communication stating that the reason lay not only in the much higher yield point of high tension steel, but also in the relatively low percentages of steel reinforcements generally adopted for concrete road slabs. His next step was to ask the Ministry if they would re-examine the particulars which led to the specification being drawn up, for under the existing conditions it was impossible to supply reinforcement of the greater weight in competition with high-tension drawn steel wire as covered by the specification.

Further correspondence passed, and Mr. Weston stated definitely that it was impossible to stress either mild steel or high-tensile steel to anything nearly so high as the elastic limit, unless the slab was cracked. To add weight to his arguments, he sought expert advice on the matter, and submitted to the Ministry of Transport reports from Messrs. David Kircaldy & Son, Dr. Oscar Faber, and Messrs. Considere Constructions, Ltd. These reports, stated Mr. Weston, showed that there was no valid reason for any preference for high-tensile steel.

The Ministry's reply to this was: "The opinions expressed in the reports have been carefully considered, and it is agreed that a higher percentage of steel than at present used in reinforced concrete roads would be greatly desirable. Having regard, however, to the present practice in this respect, the Minister does not propose to make any change in the clause in the specification for trunk road schemes relating to road reinforcement."

Mr. Weston's next step was to ask the Ministry whether mild steel and high-tensile steel could be considered on the same basis, and used as mutually equivalent. He pointed out the importance of this matter to businesses which advocated only mild steel reinforcement.

The Ministry would not admit that the experts' reports demonstrated that mild steel and high-tensile steel were mutually equivalent. They stated, however, that "when the percentage of steel used in road reinforcement shows signs of approximating to the economic percentage as used in structural reinforced concrete, then this Department will review the position, and make any adjustment necessary in the allowable working stresses." So the matter remained.

High-Pressure Gas Research.—A special course of eight lectures on "High-Pressure Gas Research" will be given at the Imperial College of Science and Technology on Friday afternoons at 4 o'clock, commencing on May 6, by Prof. W. A. Bone, D.Sc., F.R.S., and Drs. D. M. Newitt and D. T. A. Townend. The high-pressure gas research equipment in the Department of Chemical Technology will be open to inspection between 3 and 4 o'clock on each afternoon. The fee for the course is one guinea; and applications should be sent to the Registrar, Imperial College, London, S.W. 7.

JUBILEE OF THE NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Cover of the Jubilee Book.

NOTES ON THE COATS OF ARMS.

City and County of York.—The Shield of Arms of York was in use long before the College of Arms was founded in 1483, through which all coats of arms are granted, and with which it has been recorded. The sword, mace, and chapeau, or cap of maintenance—all emblems of regal authority—were also granted at different dates by the Crown, prior to the founding of the College of Arms. The City of York comes next in precedence to the City of London, and is, in fact, the premier city in the provinces; therefore in any design embodying county coats of arms of the North of England, the York Arms should have the premier position—as is the case on the souvenir handbook cover. The arms of the city did duty for the county until the formation of the Ridings.

See and County Palatine of Durham.—The County Palatine of Durham has no real armorial bearings of its own. Versions and perversions of the Arms of the City or of the See of Durham have been variously made use of. The seal of the County Council has favoured and displays the latter—namely, "Azure, a cross or between four lions rampant or." This Shield of Arms is also older than the College of Arms, with which it is recorded. The earliest use of the arms was by Bishop Robert Nevill, 1438-57; but an older form of the arms is with a cross patonce. When used by the See of Durham, the device has a mitre over the arms encircled with a ducal coronet. (Fox-Davies' "Book of Public Arms," 1915.) The arms are to the right of those of York on the souvenir.

Cumberland.—This county has no armorial bearings. The design at the top left-hand corner of the souvenir—opposite to Durham—is that usually employed, and is taken from the seal of Carlisle, but varies greatly from the form now made use of by the Carlisle Corporation, where two escutcheons are usually employed, one of which has been altered recently. The Cumberland Arms, as used sometimes, represent a peculiar kind of cross couped, closely resembling a cross portent, charged in the centre with a rose and between four others.

Northumberland.—This county has no armorial bearings. "Those attributed to Northumbria were paly of eight or and gules"—this is used here, and appears at the bottom right-hand corner. "Travesties, many of them wide of the mark, upon those of Morpeth have done duty on various occasions, but for accuracy it has been left to the seal of the Northumberland County Council to bear away the palm. The seal shows seven escutcheons, supposed or intended to represent respectively the arms of Northumbria, Berwick, Morpeth, Tynemouth, Corbridge, Hexham, and Alnwick. Of the seven, Morpeth alone is the only genuine coat of arms. Need more be said?" (Fox-Davies.)

Westmorland.—Until recently the County of Westmorland had no armorial bearings; a parody on those of Appleby being used. In June of last year, however, the County Council obtained a Patent of Arms from the College of Arms, and the armorial bearings contained therein appear at the foot of the souvenir—left-hand side, below those of Cumberland. It is an adaptation of various arms in use in different parts of the county by the old families, and when used by itself is surmounted by a ram's head with a shearman's hook thereon. The apple tree on the shield and the ram's head represent the industries of the county.

The Association, which was founded on April 10, 1877, will be holding its Jubilee Celebration to-morrow, and a highly artistic brochure has been prepared for the occasion. It commences with the following list of Presidents and Secretaries.

PRESIDENTS, 1877-1927.

Year.		Year.	
1877-8	W. J. Warner, South Shields.	1904-5	E. E. J. Anderson, Middleton.
1878-9	J. Hepworth, Carlisle.	1905-6	Matthew Leaf, York.
1879-80	Wm. Ford, Stockton-on-Tees.	1906-7	T. Hardie, Gateshead.
1880-1	J. H. Cox, Sunderland.	1907-8	H. Wilkinson, Harrogate.
1881-2	T. Trewhitt, West Hartlepool.	1908-9	Wm. Ford, Stockton-on-Tees.
1882-3	C. Sellers, York.	1909-10	T. H. Duxbury, South Shields.
1883-4	H. Woodall, Leeds.	1910-11	J. Lewis, Newcastle.
1884-5	W. H. Atkinson, Tynemouth.	1911-12	H. Tobey, Malton.
1885-6	W. Hardie, Newcastle.	1912-13	C. H. Armstrong, Wallsend.
1886-7	H. Tobey, Malton.	1913-14	E. F. Hooper, Sunderland.
1887-8	V. Wyatt, London.	1914-15	T. Waddom, Newcastle.
1888-9	T. Bower, West Hartlepool.	1915-16	do. do.
1889-90	R. Bridge, Doncaster.	1916-17	M. Fligg, Redcar (died during year).
1890-1	W. Hardie, Jr., Tynemouth.	1916-17	Wm. Hardie, Tynemouth (acting).
1891-2	R. Wallis, South Shields.	1917-18	R. Nelson, Hull.
1892-3	J. Whyte, Seaham Harbour.	1918-19	Norman S. Cox, Sunderland.
1893-4	D. Terrace, Middlesbrough.	1919-20	Harold E. Bloor, York.
1894-5	Col. Sadler, Middlesbrough.	1920-1	A. W. Branson, West Hartlepool.
1895-6	Herbert Lees, Hexham.	1921-2	F. C. Willis, North Shields.
1896-7	J. H. Penney, South Shields.	1922-3	J. E. Blundell, Carlisle.
1897-8	J. Holliday, Scarborough.	1923-4	J. Kelly, Bridlington.
1898-9	C. Dru Drury, Sunderland.	1924-5	S. Shadbolt, South Bank.
1899-1900	W. Doig Gibb, Newcastle.	1925-6	W. W. Atley, Stockton.
1900-1	E. H. Millard, Durham.	1926-7	Herbert Lees, Hexham.
1901-2	Matt. Dunn, Goole.		
1902-3	A. B. Walker, Wallsend.		
1903-4	Frank P. Tarratt, Darlington.		

SECRETARIES, 1877-1927.

1877-1885	W. Hardie, Newcastle-on-Tyne.
1885-1886	W. Hardie, Jr., Tynemouth.
1886-1897	W. Hardie, Newcastle-on-Tyne.
1897-1902	J. H. Penney, South Shields.
1902-1921	Herbert Lees, Hexham.
1921-1927	Norman S. Cox, Sunderland.

It continues as follows:

OFFICERS FOR THE JUBILEE YEAR, 1926-27.

President	Herbert Lees, Hexham.
Vice-President	T. P. Ridley, Newcastle.
Ex-President	W. W. Atley, Stockton.
Hon. Secretary and Treasurer	Norman S. Cox, Sunderland.

Committee:

D. Currie, South Shields.	C. G. Barrett, West Hartlepool
C. Dru Drury, Sunderland.	C. F. Blincoe, Middlesbrough.
F. P. Tarratt, Newcastle.	C. Turnbull, Alnwick.

Hon. Auditor . . . C. H. Armstrong, Newcastle.

THE COMMENCEMENT OF THE ASSOCIATION.

Newcastle-on-Tyne,
April 4, 1877.

Dear Sir,

The Preliminary Meeting of the North of England Gas Managers' Association has been fixed for Tuesday, 10th inst., at 1 o'clock p.m., and will be held in the Board Room of the South Shields Gas Company, South Shields, which has been kindly granted for the occasion. Trusting it will meet your convenience to attend at the hour named.

I remain,
Dear Sir, Yours respectfully
WM. HARDIE,
Secretary, *pro tem.*

This notice, calling the inaugural meeting of the Association, was issued following a preliminary notice sent out on March 13, 1877, which read as follows:

Sir,

The formation of a "North of England Gas Managers' Association" has for a considerable length of time occupied the attention of the leading Managers of this district. The subject has been discussed again and again, but no action has been taken from a fear of lessening the influence and weakening the foundation of the parent Association. Notwithstanding this consideration, there has been felt a growing want of a common bond of union amongst those following the same profession in a large and important section of the country. The counties of York, Durham, Northumberland, Cumberland, and Westmorland—a district which may be said to be not only the cradle of the gas, but also of the coal and iron trades—has no Association,

such as those which are to be found in other parts of the country, and which for some years have been pursuing a useful and successful course.

The Association now proposed is intended to be placed upon a broader basis than those already established, although conserving, at the same time, their general principles.

The objects of the Association will be the discussion of professional and financial questions connected with gas undertakings. Gas engineers, managers, secretaries, and superintendents of gas-works may be elected as Members; while others interested in the manufacture of gas or gas apparatus may be elected as Associates.

There shall be two general meetings of Members and Associates in each year—one in March and the other in September.

The subscription shall be 10s. 6d. per annum for both Members and Associates.

It is proposed to hold the first meeting on the occasion of the Exhibition of Gas Heating and Cooking Machinery, at South Shields, on April 10 next, when your attendance is much desired.

The expression of your views upon the subject, and your acceptance at an early date of this invitation, will oblige,

Your obedient Servants,

J. H. Cox, Sunderland.
W. Ford, Stockton.
J. Hepworth, Carlisle.
W. J. Warner, South Shields.
J. Booth, Middlesbrough.
W. Smith, Darlington.
T. W. Trewhitt, Hartlepool.
} Committee *pro tem.*

Wm. Hardie, Newcastle, Secretary, *pro tem.*

The Preliminary Meeting.

Mr. Ford moved, and it was carried unanimously, "That it is desirable to form an Association to be called the North of England Gas Managers' Association to consist of managers and others connected with gas undertakings situated in the counties of Northumberland, Durham, Cumberland, Westmorland, and North of Yorkshire." Mr. Whyte seconded the resolution.

Mr. Warner moved as follows: "The management of the Association shall be confided to a Committee whose decisions shall be subject to the control of the general meetings. Such committee to consist of the President, Vice-President, Secretary and Treasurer, and four Members of the Association, who shall be elected annually."

Mr. James Nicholls seconded the motion, and it was carried unanimously.

Mr. Ford moved, and Mr. Studholme seconded, that "Mr. W. J. Warner, of South Shields, be the first President of the Association." Carried unanimously.

Mr. Trewhitt moved, and Mr. Smith seconded, "That Mr. Hepworth, of Carlisle, be the first Vice-President." Carried unanimously.

Mr. Ford moved, and Mr. Warner seconded, "That Mr. W. Hardie, of Newcastle-on-Tyne, be the first Hon. Secretary and Treasurer." Carried unanimously.

Several names were mentioned for the first Committee; but ultimately the Chairman put the following to the meeting: Messrs. W. Ford, T. Trewhitt, C. Sellers, and J. H. Cox; and they were agreed to unanimously.

Mr. W. Smith moved, and Mr. Ford seconded, a motion as follows: "The Office Bearers shall assume office immediately after this meeting, and will proceed at once to draw up a constitution embracing all matters not decided upon in the resolutions passed at this meeting—such as the management of the Association, the duties of Office Bearers, proceedings at meetings, and election of new members and officers, and report the same to the general meeting." Carried unanimously.

Mr. Ford moved, and Mr. Whyte seconded, "That there be two general meetings, in the months of April and October, and that the next general meeting be held in a day in October to be fixed by the Committee." This was ultimately carried by a large majority.

First Members.

The following gentlemen expressed their willingness to become Members of the Association: Mr. W. H. Atkinson, of Tynemouth (who acted as Chairman of the Inaugural Meeting), and Messrs.—

J. Hepworth, Carlisle.
W. J. Warner, South Shields.
T. Trewhitt, West Hartlepool.
J. A. G. Ross, Newcastle.
W. Forsyth, Chester-le-Street.
S. Studholme, Whitehaven.
J. T. Jolliffe, Sunderland.
R. Ainslie, Stanley.
J. Eadington, Blyth.
J. Micklejohn, Houghton-le-Spring.
G. Rogers, Hexham.
G. Irvine, East Hartlepool.
J. Mackay, London.
A. Thorns, Leeds.
Wm. Smith, Darlington.
W. Hardie, Newcastle.
Wm. Ford, Stockton.
J. Rollo, Newcastle.
G. Ridley, Newcastle.
Chas. Potter, Newcastle.
C. Sellers, York.
J. Whyte, Seaham Harbour.
R. Smith, Darlington.
T. Mossman, West Hartlepool.
J. Nicholls, South Bank.
A. Mackay, Edinburgh.
G. A. Allan, Willington.

The following could not attend, but sent their adherence to the Association by letter:

J. H. Cox, Sunderland.
D. Sadler, Middlesbrough.
R. Moody, Gateshead.
J. Booth, Jun., Middlesbrough.
T. Forrest, Walker.
W. Belton, South Shields.

First General Meeting.

The first general meeting of the Association was held in the Board Room of the Newcastle and Gateshead Gas Company, on October 27, 1877—Mr. W. J. Warner, of South Shields, Chairman.

There was a numerous attendance.

The Secretary read the notice calling the meeting, also the minutes of the preliminary meeting, which were confirmed.

The President delivered an opening address, stating that the meeting was called in accordance with the 8th and 9th resolutions, and that the business of the day was the giving to the Committee the constitution to carry out the objects of the Association. He then pointed out the difference of the objects aimed at by the several Associations, and the advantages of such. At the close of this address the President read a note from the Secretary of the British Association, respecting advantages of similar institutions. Mr. J. Hepworth proposed, and Mr. J. H. Cox seconded, a vote of thanks to the President for his address. The meeting then proceeded to consider a code of regulations which were, after some discussion, unanimously agreed to.

Mr. Ford moved, and Mr. Smith seconded, "That Mr. Booth be auditor of the Association." Carried unanimously.

The following were admitted to be Members of the Association:

H. Tobey, Malton.
J. Watson, Morpeth.
M. Richley, Shotley Bridge.
R. Prudhoe, Spennymoor.
W. Whyte, Jarrow.
W. Burns, Sunderland.
V. Wyatt, Beckton.
D. Wemyss, South Shields.

The following were admitted to be Associates:

J. Watson, Newcastle.
W. Ashmore, Stockton.
D. M. Nelson, Glasgow.
J. Pattinson, Newcastle.
W. Allan, Stockton.
A. Donaldson, Edinburgh.
D. Laidlaw, Glasgow.

The members of the Association then proceeded to Redheugh Gas-Works, which they inspected; and they subsequently partook of luncheon provided by the Gas Company in the meter house.

The foregoing account of the formation of the North of England Gas Managers' Association, in the year 1877, has been extracted from the first transactions of the Association.

Of the original members of the Associaton, there are only three surviving at the present day—viz.:

Mr. M. Richley, of Shotley Bridge; Mr. H. Tobey, of Malton; and Mr. J. Whyte, of Seaham Harbour.

It is interesting to note that there were seventeen rules passed at the first meeting to be the rules of the Association, and to-day there are still only seventeen, some of which have, however, been amended. In addition, there are now rules relating to a Special Purposes Section.

There is also a flourishing Auxiliary Section, with Mr. C. G. Barrett, of West Hartlepool, as Chairman, and Mr. A. H. Bagshaw, of Sunderland, as Hon. Secretary.

From the efforts of those pioneer gas engineers and managers has resulted the North of England Gas Managers' Association as we know it to-day, with its 184 members and two subsidiary branches.

MESSAGES OF CONGRATULATION.

The following messages have been received.

SIR DAVID MILNE-WATSON, LL.D., D.L.,

President of the National Gas Council.

I have much pleasure in sending a message of congratulation to the North of England Gas Managers' Association on its attaining its Jubilee.

Before the gas industry was completely organized as it is to-day by the co-ordination of its national bodies, the only method of obtaining the view of gas undertakings in various parts of the country, on questions vital to the industry, was by appealing to the various Institutions and Associations of Gas Engineers and Managers throughout the country.

When the National Gas Council was first formed in 1916, the assistance received from the members of the North of England Gas Managers' Association afforded a most valuable contribution in framing the early legislative measures which sought to provide relief for the gas industry from the appalling conditions with which it was faced as a result of the war.

I am convinced that it is of untold benefit to the gas industry for gas engineers and managers in the various districts to meet regularly for the purpose of discussing their technical difficulties and disseminating knowledge with regard to improved systems of working.

In this way the North of England Gas Managers' Association has done admirable work during the last fifty years; and there are now, and in the coming years there will be still greater, opportunities for service for the industry which we are all so proud to serve.

I congratulate the Association most heartily on attaining its Jubilee, and wish it every prosperity in the future.

J. WILKINSON, O.B.E.,

President of the Institution of Gas Engineers.

May I be allowed to offer my congratulations to the President and Members of your Association on the occasion of your Jubilee Celebration. I am sure I am voicing the sentiments of every member of the Institution of Gas Engineers when I express the hope that your Association may continue to prosper and enjoy an expanding sphere of influence.

JAMES WHYTE.

Founder Member, 1877.

President, 1892-93.

Heartiest congratulations to the President and Members of the Association on the attainment of the Jubilee.

It hardly seems like fifty years since my friend, Mr. Ford, of Stockton, wrote to me at Seaham Harbour that several managers in that district were contemplating forming a local Association, similar to the three or four in existence in other parts of the country, and invited me to attend a preliminary meeting. This I did, and I had the honour and privilege of seconding the motion calling the Society into existence.

The Association was formed to meet the needs of that time, and it is pleasing to an old member to note that it has carried out its functions so well over so long a period, and is to-day even more necessary and important than in those far-off days.

I hope that it may long continue to carry out its good work.

M. RICHLEY.

Founder Member, 1877.

I first got into touch with the Association through seeing a paragraph of the projected scheme in the "GAS JOURNAL," a monthly publication at that time, and at once sent my name to Mr. William Hardie, who was then, and for many years afterwards, Hon. Secretary.

Since that time the Association has held its half-yearly and yearly meetings in the principal cities and towns embraced in its area, to which it has been cordially invited and made welcome by the Directors of companies and of corporation gas committees on all occasions.

Gas managers and their ways have undergone notable changes in reaching the present up-to-date system of manufacture and distribution; but through all these changes the objects of the Association have been fully maintained, and with unabated interest it has kept itself abreast of the times.

I congratulate the Association on its present efficient and flourishing position. It commenced with a small beginning, some three or four dozen, and has now on its present list nearly two hundred. I wish it every success in the future; and, although retired from active service, I shall always follow its doings with keen interest.

In conclusion, I hope that the next meeting will be a very successful one to complete the Jubilee.

HENRY TOBEY.

Founder Member, 1877.

President, 1886-87 and 1911-12.

I congratulate the Association on holding a meeting to celebrate its 50th Anniversary.

It has had a very successful career, and brought up a large family of useful members.

The operations of the Association were fairly wide in my day, and we used to have some very good meetings; and I am proud to think that it has grown into so large and influential a body, doing such good work and exercising so much influence throughout its area.

I can only wish the Association a very prosperous and useful future, and hope that it may be as helpful to others as it has been to me.

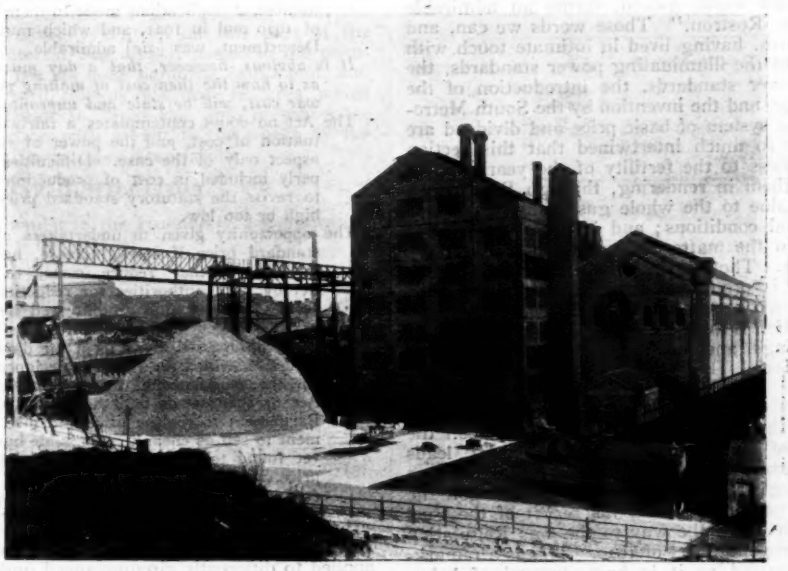
VERTICAL RETORT HOUSE AT DARLINGTON.

A Glover-West Installation.

Interesting facts relating to the early history of Darlington and to the present position of its gas undertaking are contributed by "A. E. R." to "West's Gas."

It is stated by the writer that the Gas Company was purchased by the Darlington Corporation in 1861, since which time the Department has always shown a steady growth. It has more than doubled its output during the last 25 years; the annual production of gas having now reached 660 million c.ft. In spite of the fact that £136,000 profits have been transferred in aid of the rates, and the loans outstanding on the capital of £242,000 invested in the undertaking only amount to £44,000, the works and plant are thoroughly up to date, and the price of gas is almost the lowest in the country—2s. 6d. per 1000 c.ft. for ordinary consumers, ranging down to 1s. 9d. for industrial purposes. At the same time, the Gas Department meets with keen competition from the Electricity Department, also owned by the Corporation, which supplies the cheapest electricity in the country. In spite of this, however, the gas undertaking is able to report an increase in output of over 6 p.ct. for the past twelve months; and the average amount of gas used per consumer shows a considerable increase on the previous year.

Since 1914 practically all the gas has been produced in Glover-West vertical retorts; and the present plant is capable of making 3,400,000 c.ft. per day—occupying a comparatively small site, and permitting of the dismantling of two large horizontal retort houses, which are being utilized as stores, fitters' and stove shops, garage, &c. Owing to the adoption of vertical retorts, it is anticipated that there will be no need to extend the site of the works for many years to come, as there is still room to increase the carbonizing plant by another 2,500,000 c.ft. per day.



THE VERTICAL RETORT HOUSE, WITH POWER HOUSE ON RIGHT.

[*Photograph by W. Richardson, Darlington.*

Durham coal is (save in exceptional circumstances) exclusively used for gas manufacture. A considerable proportion of partially screened and nut coal is employed, which enables the Gas Department to supply a coke that is not only dry, but comparatively low in ash content. In consequence, there is a large local sale for this coke for domestic and industrial purposes, and there is a special demand on the Continent for Darlington coke when it is available for export.

THE POWERS OF CHARGE OF THE METROPOLITAN GAS COMPANIES.*

IN 1900, there was issued from the office of the "JOURNAL" a volume, written by the late Lawrence W. S. Rostron, M.A., B.C.L., on the "Powers of Charge" of the Metropolitan Gas Companies; being a history of the question of price of gas in London, from the introduction of gas lighting to the year preceding publication. Last week—to our surprise, and without the courtesy of a single prior communication to us as publishers of the first edition—a "second edition" of the book was delivered, the title page of which shows that it has been issued "for the South Metropolitan Company" by another publishing house. True, the new volume has enlarged the history from where Mr. Rostron left it to 1926; and the work of extension has been done by Mr. F. J. Wrottesley, K.C. Courtesy in business as in social life is valuable; it hurts no man. We do consider that a breach of courtesy has in this instance been committed. Incidentally, the copyright of the first edition was registered by us in the name of the late Mr. Rostron, and in the copyright records Walter King and the "JOURNAL" offices appear as the name and address of the publisher.

In a preface to the first edition, Sir George Livesey bore testimony to the accuracy of the work of Mr. Rostron to the year 1899. In the second edition, we cannot find that revision of that work has been necessitated or done. There are 85 pages (including part of the contents) in the forepart of the book which are, *literatim* and in character of type, reproductions of the first edition. Between this substantial part of the volume which we published, and sixty pages of appendixes from it, there are interposed 69 pages of new matter by Mr. Wrottesley. Then the new volume (after the 60 pages of appendixes from the first edition) ends with seven more new pages of appendixes and the index. We mention these points not for the purpose of depreciating the value of the new material in the second edition, but to show that our view that we should not have been disregarded in respect of the publication of the second edition, seeing that it contains so much from the first one, which was printed, introduced, and published by us, is not without good foundation. Others are now trading with the second edition on the work we did for the first one. There we can leave to the judgment of readers the question of fairness and courtesy which this incident raises.

However, it is a useful work which Mr. Wrottesley has done in bringing the original volume up to date. As Dr. Carpenter says in a preface, "he has marshalled his facts with thoroughness and precision; his work, indeed, forms an admirable corollary to that of Mr. Rostron." Those words we can, and do most heartily, confirm, having lived in intimate touch with it all. The reduction of the illuminating power standards, the coming of calorific power standards, the introduction of the therm, powers of charge, and the invention by the South Metropolitan Company of the system of basic price and dividend are all matters which are so much intertwined that this section of the book bears witness to the fertility of the years and of our prime movers in them in rendering, through Parliament, work of inestimable value to the whole gas industry. It has all led to more rational conditions; and it has re-established faith in the industry in the matter of investment. But there is still work to be done. Though the part of the South Metropolitan Gas Company is prominent in it all (theirs has been most notable pioneer work, as we have always emphasized in the "JOURNAL"), Mr. Wrottesley is an impartial writer of the history of these things, and the Gas Light and Coke Company and the Commercial Gas Company are allotted their appropriate parts.

Chapter V. takes us from 1900 to the outbreak of war in 1914, which for years had such a lamentable effect upon the finances and fortunes of the gas industry. Chapter VI. leads us through that disastrous period, and brings into light once more the temporary legislative enactments bearing upon the industry. Thence we pass onwards to the report of the Fuel Research Board, which paved the way to the Gas Regulation Act and the South Metropolitan Act of 1920. This is a remarkable history when focussed as it is here, instead of being scattered through the volumes of the "JOURNAL" as the happenings called for record. As we read on, there is seen an orderly evolutionary trend about it all, with frequently the protagonists for the industry on the offensive or defensive in its interests. The soundness of the therm system of working and charging has been proved by experience. That is one of two outstanding features of post-war legislation; and the other is the basic price and dividend scheme of the South Metropolitan Company as embodied in their Act of 1920. Regarding the latter, Mr. Wrottesley says: "The Bill proceeded on the basis that capital and labour were both entitled to a fair rate of remuneration, and proposed a standard return on capital and standard rates of wages, and, in addition, some reward for increased efficiency on the part of the management and workpeople—the rewards to be in proportion to the benefits given by the undertaking to consumers in reduction of price below a given standard price." In the Act a standard (or minimum) dividend of 5 p.ct. was given on existing ordinary capital, and 6 p.ct. on future ordinary capital, with increased payments by the reduction of the selling price per therm below the basic figure. It also incorporated the statutory right of the workpeople to a co-partnership benefit based upon the results of any half-year's working in which gas was sold below the basic or standard price, increasing proportionately to the amount by which the selling price for the half year is below the standard price. "It is of interest to note," remarks the author, "that this is the first case in which the suggestion was made that Parliament should give the workpeople a statutory right in a proposal of this character, although the Company and the other Metropolitan Companies had for many years voluntarily applied co-partnership schemes." With regard to the substitution of the new proposals to take the place of the discredited sliding-scale, there is reminder that something in the nature of a precedent was to be found in the provisions governing the Sheffield Gas Company, which since 1866 had operated under a sliding-scale moving in one direction only—that is, allowing higher dividends than the standard if gas were sold below the standard price, but not *vice versa*. These and other matters are dealt with at length, as is the Gas Regulation Act, the Bill for which was introduced by the Board of Trade during the progress of the South Metropolitan Bill. The provisions of the General Act are reviewed, as are also the subsequent movements, as applying to the Metropolis, for Acts and Orders affecting standard prices, effecting amalgamations (including the Brentford with the Gas Light Company), and other matters.

In Chapter VII. experiences with the basic price are outlined, including the difficulties the South Metropolitan Company have had to encounter in defending against outside attacks their basic rate of 11d. per therm, in which they have won through. That the Gas Regulation Act as a permanent measure is not without defects is realized on all sides. On this point, Mr. Wrottesley writes:

> The Gas Regulation Act, 1920, was in a sense an emergency measure, and perhaps as good a measure as could be devised to deal on one general line with some 789 undertakings, most of which needed immediate relief. The manner in which, and the rapidity with which, the Board of Trade dealt with the large number of applications made to them under that Act at the end of 1920 and in 1921, and which must have severely taxed the Department, was [*sic*] admirable.
>
> *It is obvious, however, that a day must come when an inquiry, as to how the then cost of making gas compares with the pre-war cost, will be stale and unprofitable.*
>
> The Act no doubt contemplates a fairly frequent and serious fluctuation of cost, and the power of revision is based upon one aspect only of the case. Difficulties arise as to what is properly included in cost of production; and there is no power to revise the statutory standard price which is admittedly too high or too low.
>
> The opportunity given to undertakers always to seek a different standard price if costs increase, however slightly, and their liability, if they reduce costs, to applications under the Act by local authorities for reduction of their standard price, seem elements which might well be dispensed with as soon as it is hoped that the country, as it almost seems to have done, has passed away from the days of violent fluctuation of cost with which the Act was designed to deal.*
>
> Indeed, the experience of the working of the South Metropolitan Act of 1920 seems to indicate that the old method of leaving Parliament to fix the price and give the Company an inducement to sell as cheaply as possible has proved the best stimulus yet found to the management and the workpeople to reduce price, and has been quite as, if not more, satisfactory to the consumer than the method of constant adjustment of the standard price to the cost of manufacture.

In this last statement, there may be matter for controversy as applied to differently circumstanced undertakings.

The final pages deal with the Gas Light and Coke Company's success in Parliament in 1926 in obtaining the introduction in the sliding-scale of a minimum dividend—a matter which has frequently been referred to in the "JOURNAL," always with recognition of the initiative in regard to investment protection of the South Metropolitan Company in combination with other important innovations.

The volume, in convenient form, brings up to date the history of matters well known in the gas industry, and within a cover which is the nearest possible imitation in colour and style of that of the volume which it was our pleasure to introduce to the gas industry twenty-seven years ago.

* "Powers of Charge" of the Metropolitan Gas Companies—A History of the Question of Price in London from the Introduction of Gas Lighting to the Year 1926. Published for the South Metropolitan Gas Company by Ernest Benn, Ltd. Price 15s.

* This must have been written before the coal stoppage.—ED. "G.J."

YORKSHIRE JUNIOR GAS ASSOCIATION.

The paper at this meeting, by Mr. B. Thorpe, who is Chief Chemist to the Huddersfield Gas Department, gave an account of the method of tar treatment adopted by the undertaking.

YORKSHIRE JUNIORS AT HUDDERSFIELD ON APRIL 23.

By invitation of the Huddersfield Corporation Gas Committee, and Mr. H. Singleton, the Engineer and Manager, the members of the Yorkshire Junior Gas Association were on April 23 privileged to visit the Leeds Road Gas-Works at Huddersfield, and to hear a paper on the tar distillation plant in operation there.

The visitors assembled in the staff dining room, under the presidency of Mr. S. T. S. Musgrove (Sheffield). The paper was by Mr. B. Thorpe, Chief Chemist at the Huddersfield Works, on "Coal Tar Distillation," with special reference to the plant at Huddersfield. The reading of the paper was followed by tea, and subsequently the party were conducted over the works. A discourse on the tar plant having been delivered, chief attention naturally centred on this part of the undertaking; but keen interest was also displayed in the pneumatic handling of oxide, the hot coke handling equipment, and the method of dealing with railway wagons—features which were described in the "JOURNAL" (see Vol. 176, p. 362) some little time ago in connection with a visit to the works by the Manchester and District Junior Gas Association.

COAL TAR DISTILLATION.

By B. THORPE, Chief Chemist to the Huddersfield Corporation Gas Department.

[EXTRACT.]

Tars produced at high temperatures are composed chiefly of the aromatic series of hydrocarbons; those produced at low temperatures being of the aliphatic or paraffinoid series.

The first mention of tar was in 1741, when at the village of Dutveiler, in Germany, Stauf carried out destructive distillation of coal in a crude form of coke oven, and collected the liquid products.

In 1820 Gardin isolated naphthalene.

In 1834 Runge isolated phenol, aniline, quinoline, and pyrol.

In 1838 Bethel used tar oils for the preservation of timber.

In 1845 Hofman discovered benzene in light oils.

In 1847 Mansfield prepared pure benzene, and patented a nitration process for the manufacture of nitro-benzene.

In 1856 Perkin discovered the first coal tar dye, mauve, from aniline.

In 1856 Williams discovered quinoline blue, from which is based the manufacture of synthetic photographic chemicals.

Crude tar as a preservative of building materials has been extensively used for years past. The chief objection to it for preserving wood is the presence of free carbon and naphthalene. The free carbon prevents the tar from entering the finest pores of the wood, while the naphthalene, which volatilizes at ordinary temperatures, leaves cracks in the tar coating.

Tables I. and II. show the characteristics of tars produced in different plants, and under various conditions.

TABLE I.—*Characteristics of Tars Produced in Different Types of Plant.*

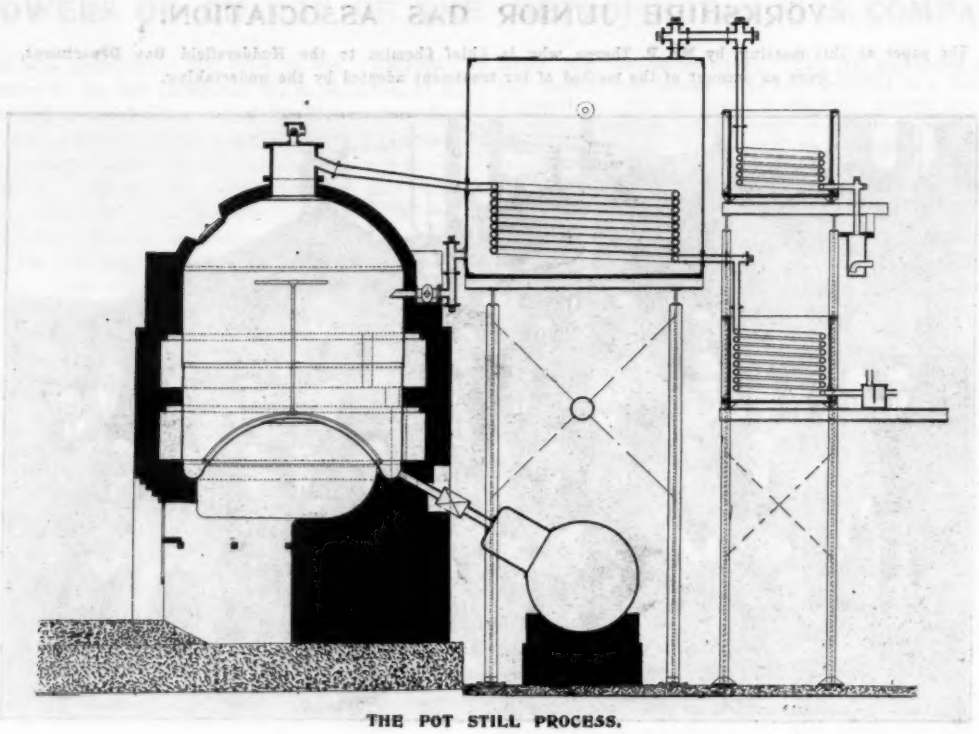
Type.	Specific Gravity at 60° Fahr.	Analysis of Tar (Water Free). P.Ct. by Weight.				
		0° to 170° C. Light Oil.	170° to 230° C. Carbolic Oil.	230° to 270° C. Creosote Oil.	270° to 300° C. Heavy Creosote Oil.	Residue Pitch.
Horizontal (high heats)	1·162	3·54	12·67	17·34	8·53	57·92
Vertical (continuous)	1·088	5·43	11·30	6·38	7·28	69·61
Coke oven (indirect)	1·148	7·23	11·52	12·28	10·15	58·82

From the above table it will be seen that the specific gravities of the tars analyzed vary with the pitch yield. The analysis of the coke oven tar gives results approximately midway between those of the horizontal and vertical tars; but when it is considered that a coke oven charge is carbonized for 36 hours, and that the mass of coal carbonized per oven is 16 to 20 tons, it is only natural to expect a tar which gives characteristics of both high and low temperature tars. The pitch yield from the tar produced in vértical retorts is abnormally high, and, together with the percentages of the oil fractions, indicates the characteristics of a low-temperature tar.

From Table II. it will be observed that the pitch yield in-

TABLE II.—*Characteristics of Tars Produced in Coal Testing Plant.*

Coal Tested.	Description.	Average Temperature in Retorts. °C.	Gas Yield per Ton of Coal. C.Ft.	Quality.		Tar Yield per Ton of Coal.		Analysis of Tar (Water Free). P.Ct. by Weight.					Separation of Fractions. 170° to 270° C.	
				Gross.	Net.	Galls.	Sp. Gr. at 60° Fahr.	0° to 170° C. Light Oil.	170° to 230° C. Carbolic Oil.	230° to 270° C. Creosote Oil.	270° to 300° C. Heavy Creosote Oil.	Residue and Losses. Pitch.	Naphthalene. P.Ct. by Weight.	Tar Acids. P.Ct. by Volume.
A	Screened	780	10,933	653	583	10·00	1·157	4·27	13·56	8 37	4·63	69·17	*Nil*	6·96
B	Unscreened	785	9,546	663	592	9·27	1·142	4·84	15·61	7·50	7·05	65 00	*Nil*	6·40
C	,,	760	10,248	703	633	10·80	1·137	7·62	16·12	9·69	4·00	62·57	*Nil*	7·25
D	,,	730	9,656	680	616	9·80	1·138	6·78	14·12	8·83	7·75	62·52	*Nil*	6·82



THE POT STILL PROCESS.

creases with an increase of temperature of carbonization, and, incidentally, with an increase in gas yield.

Tar Distillation in Practice.

Tar Stills.—It is a matter of opinion whether wrought iron or mild steel is the better metal to use in the making of a tar still. I can only speak of mild steel, which has been found entirely satisfactory at Huddersfield. The concave bottom gives extra stiffness and larger heating surface, and takes up the expansion and contraction of the metal.

The Setting of Stills.—As in the case of the retort bench, the foundation of a tar still must be solid, otherwise the various joints will leak, and flues will crack, causing inefficient heating. This will result in excessive consumption of fuel and, incidentally, reduced throughput. The arrangement which we have adopted is the ordinary wheel flue, where the products of combustion make three detours of the still before finally arriving at the base of the chimney, where they are controlled by a damper.

Separating Box.—In our case, this is very similar to an ordinary seal pot with a midfeather to within 3 in. of the bottom. The inlet half of the box is closed at the top, and a foul gas pipe is attached to this half. The box outlet is in communication with the common main, from which four branches are taken, as follows:

1. Light oil and water to open pans for settling.
2. Creosote oil to open pans for settling.
3. Heavy creosote or anthracene oil direct to storage boiler.
4. This is opened in the event of priming, and is connected direct to the tar well.

All the branches are fitted with a separate plug cock, and with the exception of No. 4 are fitted with ½ in. internal steam pipes.

At Huddersfield we separate the tar into four products—namely:

1. Light oil fraction (including water and crude naphtha).
2. Creosote oil fraction.
3. Heavy creosote or anthracene oil fraction.
4. Pitch (residue).

The qualities of the above products are varied to suit requirements, the change-point being adjusted as desirable.

The method employed at Huddersfield of changing-over from one fraction to another is by means of the Twaddell hydrometer and the specific gravity hydrometer. The latter is used for changing-over from light oil to creosote oil, and the former for the changing from creosote to anthracene, and for the end point of the distillation.

Mr. Thorpe then described an actual distillation from the starting up to the end point.

The coke consumption on our pot still works out at approximately 1·25 cwt. per ton of tar distilled. The following are the results of a test taken on the distillation of 12 tons of tar in the pot still:

Fraction.	Sp. Gr. at 60° Fahr.	Approx. Galls. per Ton.	Lbs. per Ton, Approx.	Time Required to Distil-Off. Hrs.	Mins.
Water	1·005	11·1	111	5	38
Light oil	0·955	11·5	110	0	47
Creosote oil	1·047	45·3	474	2	31
Heavy creosote oil	1·090	30·0	327	1	55
Total weight of products and time			1022	10	51
Residue (pitch) and loss on distillation (difference)			1218 (approx. 11 cwt.)		
			2240		

Hird Continuous Plant.

This plant (throughput 20 tons per diem) consists of three stills, Nos. 1 and 2 being of cast iron, with mild steel end plates, and No. 3 of mild steel. The outlet of No. 1 still is connected to the inlet of No. 2 still by a cast-iron special, and the outlet of No. 2 still is 15 in. below the inlet of No. 3 still. Heat is transmitted to the tar through 6-in. steel tubes. Nos. 1 and 2 stills contain three tubes, and No. 3 still has two. In Nos. 1 and 2 stills are fitted two baffle plates longitudinally, and in No. 3 still four baffle plates latitudinally. The working level of the tar is about 6 in. above the tubes.

There are two furnaces. The products of combustion from No. 1 furnace feed through the tubes of No. 1 still, while those from No. 2 furnace are split up; one portion feeding through the tubes in No. 2 still, and the other portion through those in No. 3 still. The waste heat from No. 2 still is utilized by passing under No. 3 still. The furnaces are coke fired, and have forced draught.

The pitch cooler consists of an oblong cast-iron box of similar dimensions to the stills, and is fitted with a baffle plate longitudinally, thus making a longer travel for the hot pitch. It is fitted with two plug valves worked vertically. The one fixed at the inlet of the pitch cooler, when seated, maintains the level of the tar in No. 3 still. It is opened for running this still. The one at the outlet, when seated, causes the pitch cooler to fill to overflow outlet; and this is opened to run-off the pitch cooler. The latter serves a twofold purpose:

1. That of heating the ingoing crude tar to No. 1 still.
2. That of cooling the outgoing pitch.

The crude tar flows through a U tube fitted horizontally in the pitch cooler. The pitch flows down a channel gulley direct from the cooler to bays.

The preheaters, three in number, are approximately 4 ft. high and 3 ft. in diameter, and contain an ordinary spiral coil through which the distillate from the still passes before entering the condenser coil. The principle is the same as that of the pot still preheater. The condensers, four in number, one for each still, and one for the vapours given off from the three preheaters, are fitted similarly to the condenser of the pot still.

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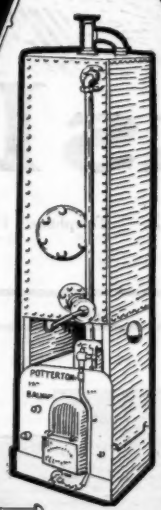

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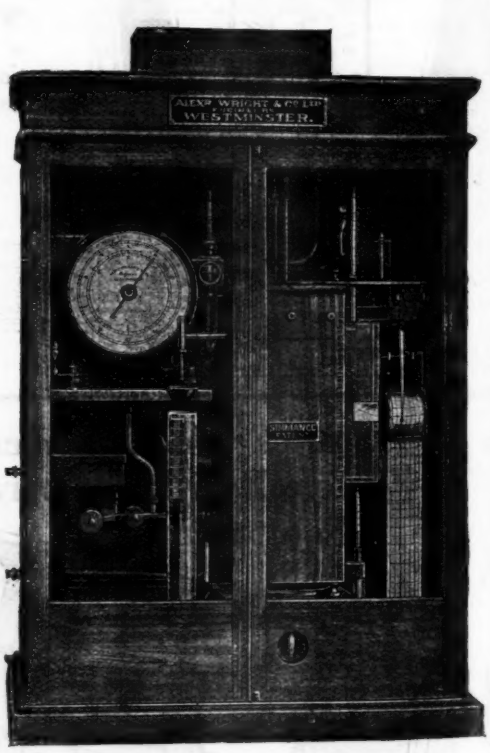

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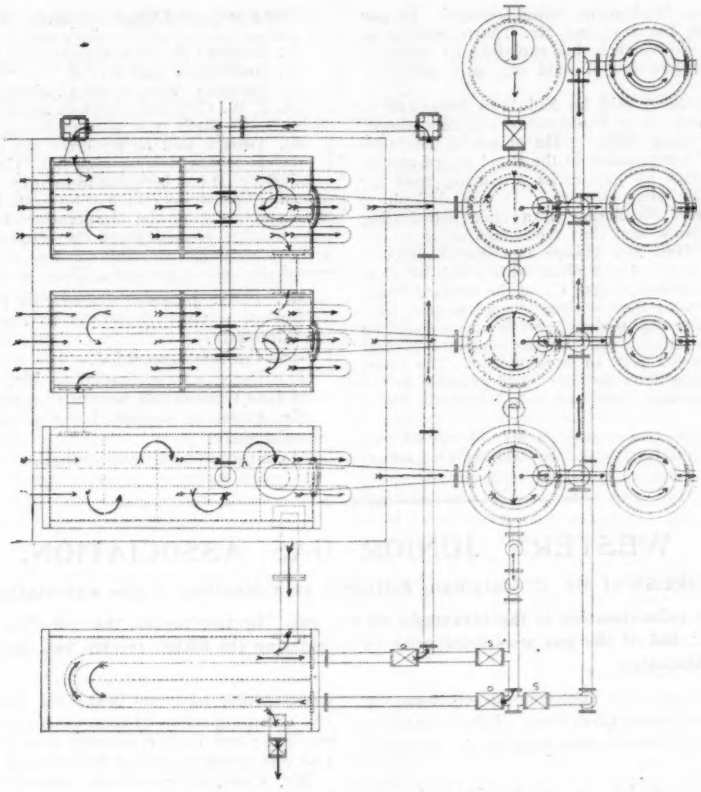


PLAN OF THE HIRD CONTINUOUS PLANT.

The outlets of the condenser coils are connected to separating boxes. These boxes are fitted with a midfeather; a foul gas pipe being attached to the inlet half of the box, while the distillates flow from the outlet half of the box to their respective storage tanks. The foul gases from each of the separating boxes meet in a common pipe, and are conducted away to an oxide purifier. The distillates from Nos. 1 and 2 separating boxes flow into light oil open pans, that from No. 3 into creosote oil open pans, and that from No. 4 to the heavy creosote storage boiler.

The regulating tank through which the tar flows to the check valve before entering the first preheater is fitted with a float valve which automatically maintains a constant head of tar in the feed tank.

Mr. Thorpe then described the starting up and working of the plant.

The average coke consumption on the Huddersfield plant works out at approximately 1·75 cwt. per ton of tar distilled. The following are the results of a test:

Duration of test, 3 hours. Tar passed through plant, 2·6 tons.

Fraction.	Sp. Gr. at 60° Fahr.	Gallons.	Lbs. per Ton, Approx.
Water	1·010	19·0	74
Light oil	0·993	33·0	126
Creosote oil	1·050	104·0	420
Heavy creosote	1·092	81·0	340
Total weight of products			960
Residue (pitch), and lost in distillation			1280 (approx. 11¼ cwt.)
			2240

Having worked both continuous and intermittent types of plant, the conclusions I have come to are:

CONTINUOUS.

(*a*) When the plant is normally working, the distillation is automatic in action.

(*b*) The brickwork does not suffer to the same degree as that of the pot still, which is subject to rapid changes in temperature due to stopping and re-starting. This must result in a saving of fuel and repairs.

(*c*) The stills themselves are not subject to as high a temperature as the pot still; the steel tubes and steel endplates bearing the heat.

(*d*) The various fractions are continuously flowing into their respective storage tanks. Consequently they require little attention.

(*e*) This plant is specially adapted for gaseous firing, which gives better control of distillates.

INTERMITTENT.

(*a*) The cleaning of the pot still is less arduous than that of the continuous plant.

(*b*) A better quality of oil is secured, and it is much easier to obtain a desired quality.

(*c*) The working of the pot still is more straightforward than that of the continuous plant.

TARS FOR ROAD TREATMENT.

In the early days, crude tar was used for road-spraying. Not only was this a wasteful method, but the crude tar was not entirely satisfactory; the presence of lighter oils, naphthalene, and tar acids preventing it from forming a good surface with the shingle, &c.

There are two road tars—No. 1 for tar spraying, and No. 2 for the manufacture of tar macadam. Under the present specification, it is possible to make road tars by two methods:

(1) By distilling the crude tar to a predetermined cut-point, found by laboratory experiments.

(2) By a process known as "oiling back." The distillation is carried nearly to pitch, and the residue in the still, after cooling slightly, is run into a boiler fitted with an agitator. A predetermined amount of creosote oil free from naphthalene and phenols is added, and the whole is agitated.

The chief disadvantage of the former method is that there is liability of not fulfilling the specification regarding naphthalene and phenols, whereas in the latter this is entirely obviated. The method adopted at Huddersfield for the making of both No. 1 and No. 2 tars is the first one, which has proved very satisfactory. These tars are made on the Hird continuous plant, the pot still plant, and a continuous dehydrating plant of our own design.

Regarding the continuous plant of our own design, this has a throughput of approximately 16 tons of tar per diem. A disused sulphate of ammonia plant superheater serves the purpose of a preheater. The tar is fed from the Hird tar regulating tank, enters the preheater at the bottom, flows up through the tubes, and enters the still at the top. The inlet pipe is projected from the top of the still to within 6 in. of the tar level. The dehydrated tar leaves the still at the bottom, enters the superheater just below the top tube plate, flows round the tubes, and passes to the tar well. The level of the tar in the still is maintained by an arrangement of overflow pipe, fitted to the outlet of the preheater.

At Huddersfield we supply the Highways and Tramway Departments with their requirements of both No. 1 and No. 2 tars, heavy creosote, Lucigen oil, and pitch. For the manufacture of the tar macadam at Huddersfield, use is made of crushed old granite setts, together with No. 2 tar.

During the last working year ended March 31, the amount of No. 1 tar sold was 220,000 gallons, and the amount of No. 2, 172,000 gallons.

Discussion.

Mr. J. MCLUSKY (Calverley) said that to him the address had been exceptionally interesting because some years ago he was at Hudders-

field; and he remembered the Hird plant being installed. It was by no means an easy plant to describe; and Mr. Thorpe was to be complimented on the lucid way in which he had explained its working. The whole question of the preparation of road tars was most important.

Mr. C. H. CHESTER (Wakefield) said he had been interested to note that the preparation of road tar at Huddersfield was done simply by distillation, and not by "oiling back." He presumed Huddersfield were taking advantage of a regulation in the Road Board specification which allowed exemption to gas-works producing road tar regarding the amount of naphthalene present. It was difficult to keep within the limit by direct distillation in a Hird dehydrating plant. Tar from inclined retorts and that from horizontal retorts required different treatment. Had Mr. Thorpe experienced difficulty in treating the two different tars? On a plant with which he (Mr. Chester) had experience, they worked at 255° C. on the inclined retort tar, but on the horizontal retort tar they worked at 230° to 240° C.

Mr. THORPE, in regard to the naphthalene, said it was some time since he had had occasion to make a test; but he remembered that a test of No. 1 road tar gave 8·2 p.ct. of naphthalene. The limit, of course, was 8 p.ct. He thought no tar user could grumble at the excess of 0·2 p.ct. At Huddersfield they had only horizontal retort tar.

Mr. GRIFFITHS (Bradford) expressed surprise at Mr. Thorpe's figure for the pitch content of vertical retort tar. In Glover-West tar at Bradford they got 60 p.ct. of pitch. The Woodall-Duckham tar gave 65 p.ct.

Mr. THORPE: At what temperature do you end your distillation?

Mr. GRIFFITHS: 320° C.

Mr. THORPE: That is 20° C. above ours.

Mr. J. W. CARLTON (Shipley) asked whether Mr. Thorpe could tell them if the plant was self-supporting or profit-making.

Mr. THORPE said he preferred not to answer this question.

Mr. H. SINGLETON assured Mr. Carlton that the plant was very profitable. It had been put in in 1917; and within a few years of commencing operations they had no capital charges whatever. The pitch was purchased by the Corporation Highways Department, as also was a large percentage of the creosote oil. About 80,000 to 90,000 gallons of prepared road tar was taken by the Department. The remainder, about 300,000 gallons, went on to the open market.

Mr. F. J. JACKSON (Sheffield) proposed, and Mr. CARLTON seconded, a vote of thanks to the author, which was carried unanimously.

Mr. THORPE responded.

The PRESIDENT extended to Mr. Singleton and the Huddersfield Gas Committee hearty thanks for their hospitality.

Mr. CHESTER seconded the proposition, which was adopted unanimously.

Mr. SINGLETON briefly replied.

WESTERN JUNIOR GAS ASSOCIATION.

PRESIDENTIAL ADDRESS of Mr. C. Bateman, delivered at a Meeting of the Association in Bath on April 9.

Mr. Bateman calls attention to the advantages of dry gas. In this regard, the waterless gasholder would be advantageous; and if the gas were dried prior to its entering the holder, trouble from emulsified tar in the seals would be eliminated.

May I first of all thank you most sincerely for electing me President of the Association for the past year. I feel that it is a great honour, especially as it is the first year of the Western Junior Gas Association.

Looking back over our session, I must say that it has been a most successful period. I have been a member of several Junior Associations, and, though they were old-established organizations, I cannot recollect any of them having a programme which equalled ours. We started-off with several difficulties, which, by the excellent co-operation of the Council, have been easily surmounted; and we are now safely on our feet with a membership of 71.

When it is considered that twelve months ago we had no area allocated to this Association, it is very satisfactory that we have now been allocated the area in the West of England which we required. This has only been done, of course, with the co-operation of the London and Southern District Junior Gas Association and the Midland Junior Gas Association; and our thanks are due to them for the excellent way in which they have helped us in this matter.

We are much indebted to the larger undertakings in our area for the hospitality they have extended to us on many occasions during our first session, and also to the Gas Light and Coke Company, whom we visited last year.

In November of last year we had an inaugural address by Mr. H. D. Madden, of Cardiff, which I am sure inspired all of us. Since that time we have had technical papers by three of our own members—namely: Mr. Hole, of Bath, Mr. Lloyd, of Weston-super-Mare, and Mr. Marsden, of Bristol.

COMPARISON OF UNDERTAKINGS.

When writing this address, I decided to touch briefly on several new or interesting points which particularly appealed to me, and not to write a paper on one subject alone. The first and foremost point in my mind is the comparison of one undertaking with another. This is a subject which is always under discussion, especially at the time when the balance-sheets are issued; and it is both interesting and instructive to compare several balance-sheets one with another. I suggest that you try this comparison. One might say that it is difficult to find works of similar capacity in order to make the figures comparable; but it is easy to increase or reduce them proportionately, to make this possible.

It is surprising where some of the big differences arise; and I would point out that, whereas often the difference in the selling price of gas between two undertakings is put down to the difference in capital, this is not always the case. In fact, the difference in the selling price of gas, due to this item, between undertakings with large and others with small capital accounts is practically negligible, as, of course, the amount of capital has its limitations in both ways. Even allowing for extreme cases, the difference reduced to the cost per therm is only a fractional amount.

A point one often hears mentioned when comparing two undertakings is the yield of therms per ton of coal carbonized. Personally I never attach any importance to this figure. For instance, results (say, of horizontal retort house practice) of 72 gaseous therms per ton, as against (say) 60, do not impress me. Retort house working has to be efficient; and efficiency can only be achieved by watching the multitude of minor details, which together make for perfection. It is not so much the therms per ton of coal that count, but the therms per pound sterling; and I often wonder how much it really costs to get the last one or two gaseous therms out of a ton of coal.

Mr. Carr, of Stretford, refers, in a paper he has recently given, to the old saying that "profits are made and lost in the retort house." This is a sweeping statement; and it is difficult to come to any conclusion as to its limitations. Personally, I think that, though efficiency is essential to retort house working, it is far from being the most important factor of any undertaking.

OIL GAS.

Oil gas manufacture during the past few years has been modified a great deal. The application of waste-heat boilers for this purpose is standard practice, though the best type of boiler to use still seems to be a debatable question. A more recent improvement appears to be the "back-run" process. Though I have had no actual experience with this, I believe it is an excellent proposition, and that the capacity of any plant can, with moderate outlay, be increased by 50 p.ct. This obviously decreases the manufacturing costs proportionately, for no extra labour is entailed.

An automatic clinkering grate has also been put on the market, which will, I think, eventually prove to be a valuable asset to any water gas plant. At the moment, it is hardly out of the experimental stage; but should it become possible to produce it at reasonable cost, I think it will be universally adopted.

EXTRACTION OF DUST AND FLYERS FROM BLOW GAS.

In Bath, we originally had the usual type of cast-iron outlet pipes, with internal water spray. This proved unsatisfactory. In the first place it was difficult to get a really efficient spray; secondly, wear and tear due to corrosion was heavy. There were continual pumping charges to bear, which undoubtedly add considerably to the manufacturing costs. We have recently installed on one of our plants a "Centriflovane" manufactured by the Tipton Tub & Tube Company, Ltd. This has only been working for a short period, but so far has been entirely satisfactory. It has many advantages. There is no water spray, and therefore no corrosion. There are no pumping charges. The dust and flyers are extracted by a series of vanes in the cowl, which gives them a swirling motion, and are then deposited in a suitable retainer. At the same time there is no undue back-pressure to the blast gases.

We have carried out tests on this plant since it was installed; and the results are as follows:

Plant Clinkered.

	Lbs.	Ozs.
Grit collected 1st blow after clinkering	24	4
" " 2nd " " "	3	4
" " 3rd " " "	5	2
" " 4th " " "	2	10
" " 5th " " "	3	8
" " 6th " " "	3	2

Plant Coked.

Grit collected 1st blow after coking	4	15
" " 2nd " " "	4	0
" " 3rd " " "	3	0
" " 4th " " "	2	5
" " 5th " " "	2	7
" " 6th " " "	2	8
" " 7th " " "	2	7

Total grit collected in 24 hours, 10 cwt.

It is of interest to note from the above figures that the quantity of flyers varies according to the state of the generator.

DRYING OF PURIFIED GAS BY CALCIUM CHLORIDE.

An interesting problem which recently has come to the fore is the drying of gas. A good deal of experimental work has been carried out in this respect; and I think that Messrs. W. C. Holmes & Co., Ltd., of Huddersfield, deserve a great deal of credit for the pioneer work they have done. A satisfactory system has now been evolved by them, and they already have some plants at work. The one on which most of the experimental work has been done is at the Taunton Works. I understand that several plants have now been ordered for this work.

In our own works we have gone carefully into the matter; and it is probable that in the near future—that is, when some of the more important reconstructional work is completed—we shall convert some of our scrubbing plant into a gas drier.

Corrosion in mains (steel) is due to the presence of water vapour, oxygen, and hydrocyanic acid. If water is removed wholly, or to such an extent that deposition does not take place with the falls in temperature usually experienced in distribution systems, corrosive action does not occur. Gas leaving the holders—*i.e.*, inlet to the distribution system—is saturated at a given temperature, and will at once deposit moisture with the slightest temperature drop. (Syphons near works show this fact, as they have to be pumped more frequently.)

EXPERIMENTAL WORK.

Tests made in December, 1926, and January, 1927, showed that the gas directly on the outlet of the station governors at 60° Fahr. contained 0·944 gallons of water, as vapour, per 100 c.ft. By the use of a small glass scrubber immersed in freezing mixture, 90 p.ct. of this water was removed. It is, of course, impracticable to use such a method on a large scale—apart from the effect such treatment would have on the calorific value of the gas.

Several substances are available for the removal of water from the gas, but the majority are ruled out on the score of expense of the raw material, its effect on plant used, &c. The drying agent should be cheap, and should have no corrosive action on the plant it is used in, and the gas should be unaffected by it. Such a reagent is a saturated solution of calcium chloride at 60° Fahr. Calcium chloride has a valuable characteristic in that it is easy to drive off the absorbed water, bringing the solution back to its saturation point. Theoretically there should be no losses at all, but on a working scale there would be small mechanical losses, due to the splashing of the reagent during reconcentration and handling. These losses, however, would in total be very small indeed.

As calcium chloride absorbs moisture from gas, there is a slight rise in temperature. This added heat must be eliminated by a system of reagent coolers; the chilled reagent being returned to the washer. A simple continuous system can be easily worked out.

Given a suitable washer in which intimate contact between gas and drier is maintained, it is a simple matter to reduce the moisture content of the gas by 60 p.ct. This will leave the gas in such a condition that moisture deposition will not take place until very low temperatures are reached—say, 30° to 34° Fahr. Such temperatures would be rarely attained for any length of time in a distribution system. A slight rise in the temperature following such a fall would, therefore, result in the re-absorption of the deposited moisture. It follows that shortly after drying operations had been commenced, the water already existing in mains and syphons would be absorbed, leaving the distribution system in a dry condition.

For success to be maintained, the drying must be at either the inlet or the outlet of the holder. The former place being naturally the most suitable, on account of the more regular flow of gas. The water in the holder tank must be covered with a film of oil, to prevent the dried gas from becoming resaturated.

The deposition of moisture by cooling gas also affects the formation of naphthalene deposits very considerably. In other words, moist gas cannot carry so much naphthalene as dry gas, at temperatures up to 102° Fahr. As the moisture in the gas is thrown down by cooling, it carries with it naphthalene. It is easy experimentally, by cooling to 0° C. a gas saturated with moisture and naphthalene, to get 100 p.ct. naphthalene removal. With a dry gas saturated with naphthalene treated in the same way the whole of the naphthalene is not removed from the gas by simple cooling.

It follows that, with an equal degree of naphthalene saturation, a moist gas will deposit naphthalene before, or in greater quantity than, a dry one. The bearing of this upon stoppages in the distribution system is easily realized. Without a naphthalene washing plant, a works distributing dry gas will benefit considerably.

TANKLESS GASHOLDER.

Waterless holders have been built on the Continent from 30,000 c.ft. capacity up to 10 million c.ft. At present there are four holders of 4 million c.ft. in course of construction on the Continent, and two of 15 million c.ft. in America. Recently a prominent gas engineer stated that he would have no hesitation in installing a holder of 30 million c.ft. capacity.

In this country there are two holders of this type in course of construction, one of 2 million c.ft., for the Ipswich Gas Light Company, and the other for the Gas Light and Coke Company.

Over a hundred holders of the waterless type have been erected during the last ten years, and they are, I believe, giving every satisfaction.

Consider the following advantages:

(*a*) No water tank.
(*b*) No heating plant.
(*c*) Small and inexpensive foundations.
(*d*) Minimum cost of attendance and of renewal of paint.
(*e*) Minimum building required, thus keeping down initial, as well as working, costs.
(*f*) Dry gas.
(*g*) Constant pressure.
(*h*) Enlargement of holder possible without stopping work.
(*i*) Easy accessibility to all parts.

I think you will agree with me that the waterless system of gas storage is not to be despised, especially by those wishing to keep down initial and working costs.

In conjunction with gas drying, tankless holders have their advantages, as they will eliminate the difficulty of dry gas picking up moisture while being stored. On the other hand, what might be one of the chief drawbacks of the tankless holder would be overcome by using dry gas—that is, there would be no variation in viscosity of the tar used to maintain the seal. In the past there has been, I believe, a difficulty in this respect, inasmuch as the tar itself becomes emulsified by absorbing moisture from the gas; the seals being affected to a greater extent by weather conditions when an emulsified tar, rather than tar of constant viscosity, is used.

MAINTENANCE.

Regarding maintenance, the greatest difficulty is how the cost is to be met, so that the charge may be equitable to each consumer. In my opinion, it is best that the maintenance cost should be included in the price of gas. Thus the proper charge would be borne by all consumers, according to the number of appliances they have. While this would undoubtedly appeal to undertakings who are supplying gas at a low figure, it is probable that the policy would not find favour with some, as they would not wish a further increase in their selling price, even by a small amount.

The other alternatives are: (1) To issue appliances on simple hire; the hire charge being sufficient to cover the cost of maintenance. (2) To charge direct for each visit of the maintenance inspector. Both these methods have their disadvantages. In the case of the former, a great many undertakings, including my own Company, do not encourage simple hire. Though we still have a considerable number of appliances on simple hire on the district, we are not encouraging this method; and the number is gradually decreasing. With the second method (*i.e.*, to charge direct for each visit) the difficulty arises in the handling of small sums of money.

The appliances which we still have on simple hire in Bath are automatically maintained free of charge. In addition we have a system of burner maintenance, by which labour is supplied free, and only the cost of renewals charged to the consumer. We are hoping that all appliances, whether privately owned or otherwise, so long as they are in the Company's area of supply, will be eventually maintained by this system.

EDUCATION.

It has been felt for some time that the Education Scheme of the Institution of Gas Engineers as at present constituted does not enable a large percentage of possible students to qualify, through the varying stages, for the Diploma, which was to be the crowning of a number of years of study and practice. Many cases undoubtedly exist, even in the industrial districts where educational facilities might reasonably be expected, where it is impossible, either through lack of such facilities in the higher stages, or through time taken to reach such centres, for students to qualify in the varying grades of study.

In a widespread area such as ours, with only three approved centres of Higher Education—*i.e.*, Bath, Bristol, and Plymouth—the difficulties are correspondingly increased. There was also a strongly expressed opinion that students should be allowed to obtain their knowledge by the best alternative methods open to them. In order, therefore, that equal chances be given to all, irrespective of geographical position, the Institution of Gas Engineers should be responsible for the whole of the examinations, and these should be conducted on the same lines as those of the Institution of Civil Engineers or the Institute of Chemistry. Providing the student can show several years of training in practical work, the passing of the examinations should prove competence, and also carry with it the reward of associate membership or full membership of the Institution of Gas Engineers, as the case may be.

At the forthcoming meetings of the Institution in June, I understand that a modified scheme will be presented, designed to meet the difficulties of numbers of students isolated from approved centres of education, and also of those who only have courses of limited use available at present.

It is of considerable interest that the present trend of supple-

mentary education is towards concentrating the whole of the subjects, at present extending over several evenings, into one day; courses of lectures being taken in the morning, afternoon, and early evening of one day, thereby reducing the time lost in travelling, &c., to a minimum. The students under such schemes are drawn from a fairly wide area. Accordingly, if facilities can be arranged at technical schools, and gas undertakings will allow prospective students leave of absence to attend such courses, it will go a long way towards making the Education Scheme one of much greater utility than it is at present.

In conclusion, I will refer to Mr. Thomas Hardie's recent Presidential Address to the Southern Association of Gas Engineers and Managers. Mr. Hardie, as you all know, is the Chief Engineer of the Gas Light and Coke Company, and with a Company of that magnitude there is every facility for the comparison of different types of plant. Regarding carbonizing wages, given in pence per ton of coal carbonized, I notice that the horizontal method is the cheapest; and what appears to me to be the main reason for adopting verticals in some cases is the difficulty of obtaining ground space in the London area.

Mr. A. Marsden proposed a vote of thanks to the President, and congratulated him on the scope of his address. If it was true, remarked Mr. Marsden, that profits were made in the retort house, it was also true that they could be lost outside. With regard to the automatic clinkering grates, trouble arising from these seemed to be due to the mixtures of fuel used. A gas drying plant in course of erection at Bristol was nearing completion; and he hoped it would be possible for the members to inspect it in the near future.

Mr. Barrett, in seconding the vote, said how much the President had helped in the starting and carrying-on of the Western Junior Gas Association.

Mr. Bateman acknowledged the vote of thanks.

Following tea, the annual general meeting was held.

Officers for the Session 1927-1928.

President.—Mr. Arthur Marsden, Bristol.

Senior Vice-President.—Mr. T. L. Armitage, Cheltenham.

Junior Vice-President.—Mr. J. T. Spencer, Weston-super-Mare.

Hon. Secretary.—Mr. G. C. Gunston, Bristol.

Hon. Treasurer.—Mr. E. Evans, Gloucester.

Council.—Messrs. S. Hole (Bath), A. Barrett (Frome), J. Conway (Bristol), S. S. Lloyd (Weston-super-Mare), B. F. Harris (Trowbridge), and W. M. Paterson (Bath).

Hon. Auditors.—Messrs. F. J. Marlow (Weston-super-Mare) and H. W. Randall (Stroud).

A vote of thanks to the Directors of the Bath Gas Company for their courtesy and hospitality was proposed, and was carried unanimously.

MANUFACTURE OF SULPHURIC ACID AND SULPHATE OF AMMONIA FROM CALCIUM SULPHATE.

[From "Le Génie Civil," Feb. 5.]

The great source of sulphuric acid is iron pyrites; but as there is none in France, it has to be imported, much to the detriment of the economic balance-sheet. Consequently wide interest attaches to the manufacture of sulphuric acid from a home source, gypsum, of which there are considerable deposits, notably in the Paris basin; and numerous experiments have been made, employing both wet and dry methods. M. J. H. Frydlender brought the matter up to date in a recent issue of the "Revue des Produits Chimiques."

Wet Treatment of Calcium Sulphate.

The process of treating the calcium sulphate with ammonium carbonate, particularly with a mixture of carbonic acid and ammonia, has acquired an industrial status with the Badische Anilin und Soda-Fabrik, who practise it on a big scale, linking it with the Haber process of ammonia synthesis. The formula involved is—

$$CaSO_4 + 2NH_3 + CO_2 + H_2O = (NH_4)_2\,SO_4 + CaCO_3.$$

The commercial consummation of this double reaction was long obstructed by the difficulty of separating out the precipitate, which is of a colloidal nature, and of recovering the ammonium sulphate.

The Badische Works now employ suction filters. These are immersed in the sludge, vacuum is applied, and the precipitate settles out. When the deposit is sufficiently thick, it is washed and detached from the frame.

As for the extraction of the ammonium sulphate, it is necessary for commercial working that the double reaction between the calcium sulphate and the ammonium carbonate should give a homogeneous sludge; and this is effected by the employment of the Otto column, which renders the reaction continuous. At the top of the column is introduced a mixture of powdered gypsum and water (or preferably ammonium sulphate liquor). At the bottom, ammonia, carbon dioxide, and water vapour are forced-in under pressure. The injection of these gases is regulated so that the liquid contains no free ammonia on its arrival at the base of the column. The sulphate crystallizes out in the sludge; and after decantation the liquor is returned to the column.

The Farbenfabriken A.G. (formerly Fr. Bayer) took out, in 1919, a German patent for the production of sulphur dioxide and cement. Firing took place in an oxidizing atmosphere. An intimate mixture is made of 110 parts by weight of gypsum, 10 of sand, 14 of kaolin, and 5 of carbon—the whole finely pulverized. This is then heated in a rotary retort until it is calcined. The mass is then ground, while the gases—sulphur dioxide and carbon dioxide—are passed to the sulphuric acid plant.

In the laboratory experiments at a temperature of 1400° C., a clinker of granular cement was obtained, of the composition of a good Portland cement. The large-scale tests, undertaken later, demonstrated the necessity of drying the charge before retorting, so as to obtain the sulphur dioxide sufficiently concentrated. The installation, consisting of two retorts 50 m. [164 ft.] long and 2·5 m. [8¼ ft.] in diameter, had a capacity of 200 metric tons [197 tons] of mixture a day.

Instead of kaolin, slate clay may be used; being first crushed and then passed through a drying drum. The calcium sulphate (natural anhydrite or the chemical residual) and the coke are similarly crushed and dried. The exact proportions of the three are then pulverized, intimately mixed in a ball mill, and passed into the retort.

The "clinker," produced with granular slag, and the gypsum necessary for the setting properties of the cement, are passed to a mill-mixer. The gases, which are led off the upper part of the rotary retort, have a sulphur dioxide content of 6 to 7 p.ct.; and they are submitted to dust elimination and washing before passing to the sulphuric acid plant.

It seems that the substitution of marl or limestone by calcium sulphate makes no great difference to the cost of kilning.

It is pointed out that in 1910, nine years before the Bayer patent, Basset had in a French specification protected the reduction of calcium sulphate by siliceous materials, to obtain "saleable bye-products, making economic the preparation of sulphuric acid from gypsum." His patent was based upon observation of the affinity of calcium sulphate for lime evinced in the manufacture of Portland cement. He added, to the mixture of calcium sulphate and clay, sufficient carbon to convert a quarter of the sulphate into sulphide; the following reaction then taking place:

$$3\,CaSO_4 + CaS = 4\,CaO + 4\,SO_2.$$

M. Frydlender examined critically the Bayer and Basset processes, and concluded that in principle the former showed no advance on the latter. But it must be realized that in Germany—alone at present—sulphuric acid and cement are produced on a large scale from calcium sulphate; the Bayer Works having succeeded in setting this delicate process on a commercial footing with wide possibilities.

Long-Distance Gas Distribution.

A joint-stock company is to be formed in Central Germany, under the title of Braunkohlengas A.G. (Lignite Gas Company), with a share capital of 2,000,000 mks. (£100,000), to study the problem of long-distance distribution of gas produced from lignite. It is of interest to note that the sole patent rights throughout the world for the manufacture of gas from brown coals and lignite suitable for long-distance transmission are in British hands. They have been taken out by the Sensible Heat Distillation Company, and will be worked in Germany by the German branch of that Company—the Continentale "L. & N." Kohlendestillation A.G.—and in Australia by the Commonwealth branch of the parent Company. The Australian Company will be known as the "L & N" Brown Coal, Ltd. It is proposed by the new system to produce the gas in the centre of some industrial district, as close to the pithead as possible, and to pipe it for light, heat, and power purposes over a radius up to 90 miles.

COAL AND BYE-PRODUCTS EXPORTS AND COAL AND OIL IMPORTS.

The Board of Trade returns relating to exports and imports for March and for the first quarter of the year have been issued.

COAL EXPORTS.

We think it may be said that the coal export trade has succeeded in recovering normal conditions. Individual returns relating to the different countries with which trade is carried on show comparatively small variations with those appertaining to 1926 and 1925. The total quantity of coal exported in March was 4,819,912 tons, which compares with 4,702,536 tons in 1926, and 4,392,258 tons in 1925. The values were as follows: March, 1927, £4,459,789; 1926, £4,184,079; 1925, £4,557,002. Of these figures the shipment of gas coal in March represented 664,337 tons, as against 642,034 tons in March, 1926, and 600,104 tons in March, 1925. The values attached to gas coal in March of the three years are: 1927, £573,036; 1926, £526,238; 1925, £603,672.

Taking the figures for the quarter, the total exports amounted to 13,085,647 tons, compared with 13,190,584 tons in 1926, and 13,102,317 tons in 1925. The values were: 1927, £12,733,277; 1926, £12,031,042; 1925, £13,803,726. The gas coal exported in the three months totalled 1,741,185 tons, as against 1,747,963 tons in 1926, and 1,720,846 tons in 1925. The values of these three last quantities were: 1927, £1,553,367; 1926, £1,424,382; 1925, £1,760,802.

GAS COKE SHIPMENTS.

The recovery in the export trade has extended to gas coke, but the export trade in metallurgical coke continues very poor. In March, the gas coke sent abroad amounted to 71,997 tons, compared with 78,965 tons in 1926, and 52,658 tons in 1925. The values were: 1927, £82,401; 1926, £81,247; 1925, £76,400. In the quarter, 193,804 tons were exported, as against 336,611 tons in the corresponding period of 1926, and 158,178 tons in that of 1925. The aggregate values were: 1927, £228,583; 1926, £347,963; 1925, £240,085.

Regarding metallurgical coke, in March only 32,413 tons were shipped, as compared with 99,307 tons in 1926, and 96,115 tons in 1925. The values were: 1927, £48,122; 1926, £112,690; 1925, £122,662. In the three months, only 87,482 tons of metallurgical coke have been sold abroad, compared with 303,544 tons in 1926, and 336,284 tons in 1925. The values were: 1927, £136,060; 1926, £342,573; 1925, £448,773.

TAR PRODUCTS SHIPMENTS.

The export business in these continues very flat. In March, only 3066 gallons of benzole and toluole were exported, compared with 20,734 gallons in March, 1926. In the three months 22,244 gallons were sent abroad, as compared with 396,826 gallons in the same period of 1926. Naphtha is now an almost negligible quantity. Only 2797 gallons were exported in March, compared with 7562 gallons in March, 1926. The total for the three months amounted to 9370 gallons, as compared with 41,609 gallons in the corresponding period of 1926. Regarding tar, oil, creosote, &c., March showed an aggregate export of 3,955,677 gallons, which compares with 5,132,566 gallons in March, 1926. There has been a tremendous drop in the first three months of this year. The total was 5,652,687 gallons, as compared with 13,604,660 gallons in the first quarter of 1926.

SULPHATE OF AMMONIA.

The decline in the demand from abroad for sulphate of ammonia is further expressed by the returns for March. In that month 16,594 tons were shipped, as compared with 23,405 tons in March, 1926. In the three months, the total was 36,161 tons, as against 66,489 tons in the same period of last year. Spain and the Canaries during the quarter have only required 9834 tons, as compared with 14,651 tons in the first quarter of 1926. The Dutch East Indies has been a particularly bad market, purchasing only 369 tons, as against 14,764 tons in the first three months of last year. Japan has only taken 9296 tons, as against 15,929 tons in the first quarter of 1926. The competition of the synthetic product is being heavily felt.

COAL IMPORTS.

Naturally last month there was a substantial falling off in the quantity of coal imported under contracts entered into during the coal stoppage. Only 102,443 tons were received, the value of which was £252,268. In the eight months May to December, the quantity of coal imported was 20,033,370 tons (valued at £43,020,554). The coal landed, under unexpired contracts, this year has amounted to 2,313,116 tons (valued at £6,392,529); so that since last May we have received from abroad 22,346,486 tons of coal, valued at £49,413,083. The miners and coal owners of other countries have benefited generously from the folly of the British Miners' Federation.

GAS OIL IMPORTS.

The flow of gas oil into this country continues on the high scale. In March, 9,667,344 gallons were received, as compared with 6,661,683 gallons in March, 1926. In the three months, 36,745,351 gallons were imported, as compared with 15,241,840 gallons in the first quarter of 1926. These figures, of course, do not include the quantity placed on the market from the distillation of crude oil in this country.

Verticals v. Horizontals.

In "West's Gas," under the heading "Talking about Work," "T.A.T." says: The technical event of the month was the Presidential Address of Mr. T. Hardie, Chief Engineer to the Gas Light and Coke Company, London, to the Southern Association of Gas Engineers and Managers. It contains data of the utmost value. Particularly interesting to us is the comparison of Glover-West vertical retorts with horizontal retorts, both on Durham coals, and both operated under the most capable direction in the world. It may now be taken that 72 therms per ton is the highest make that can be produced under these conditions in horizontal retorts. The corresponding figure for the vertical retort is 78, and that at 510 B.Th.U. By steaming, the yield in vertical retorts could be increased to 83 therms per ton at 475 B.Th.U., and probably still more at lower calorific values. The labour cost per ton in horizontal retorts is 15·90d., as against 15·93d. in the vertical retorts. The corresponding labour cost per therm can be deduced from the figures given, and works out to 0·221d. in the horizontals, against 0·202d. in the verticals. That is to say, the cost per therm is 9·4 p.ct. greater in the horizontals than in the vertical retorts, when making gas at 510 B.Th.U. from Durham coals.

Gas Research at Michigan University.

Prof. A. E. White, head of the Department of Engineering Research at the University of Michigan, has announced the receipt of a contribution of $10,000 from the American Gas Association, for the carrying out of a programme of intensive research in connection with the use of gas for steel treatment. It has been stated by Mr. Alexander Forward, the Managing Director of the American Gas Association, that the appropriation is from a special fund of $500,000, which is to be utilized in a five-year programme of research in the field of large-scale industrial use of gas. The University is situated almost in the centre of the steel-treating industry. The "Gas Age-Record" says that the work, which will be undertaken in co-operation with the Surface Combustion Company, will be under direction of Profs. A. H. White and A. E. White. Prof. A. E. White is Past-President of the American Society for Steel Treating, and for many years has devoted a major portion of his time to metallurgical problems. During the war he was head of the Metallurgical Department of the Inspection Division of the United States Army Ordnance Department. Prof. A. H. White has had contact with the Michigan Gas Association for more than 20 years, and has an intimate knowledge of the gas industry.

Pulverized Carbonized Fuel.

Following the recent announcement by one of the leading British shipping companies that consideration was being given to the question of reversion to coal as fuel for liners, a message has been received from Germany advising that the German Marine Department are to carry out a series of tests with pulverized fuel as a substitute for oil. It is a fact, also, that, basing their conclusions on extensive tests carried out in the United States of America, several of the large steamship companies are ready to convert their boats to pulverized fuel; and that for new tonnage, until pulverized fuel is available, the boilers will be arranged to burn oil in the meantime. Hitherto the main objection to the use of pulverized fuel has been its low flash-point. This danger has been eliminated by the extraction of the oil and gas content of the coal, and the pulverization of the residual fuel. Recent tests carried out at the works of Messrs. Clarke, Chapman, & Co., Ltd., engineers, boilermakers, and electricians, Gateshead-on-Tyne, with "L & N" pulverized fuel have given most satisfactory results. The actual reading taken from the temperature in the furnace fitted to a marine type boiler showed an average heat of 1590° to 1610° C., with 69·3 p.ct. efficiency. Further work, however, will bring the efficiency to above 80 p.ct. Tests carried out by the cement manufacturers with similar fuel have given extremely satisfactory results. It is of interest to note that this fuel is best produced from the low-grade coals, notably slack, thus ultimately opening up a new and large market for grades of British coals which hitherto have not commanded prices even approaching the cost of production.

PRIMARY DECOMPOSITION OF COAL.

There has just been published (H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; price 9d. net) Fuel Research Technical Paper No. 16—"The Primary Decomposition of Coal: 1. The Temperature of Initial Decomposition." The results of this investigation show that coal, when carefully heated out of contact with free oxygen, decomposes to produce visible amounts of liquid oils at temperatures varying from 180° C. for peat to 215° to 245° C. for bituminous coals. This decomposition continues for some hours at least if the coal is maintained at the initial temperature. With bituminous coals the temperature of initial decomposition appears to increase with increasing oxygen content and decreasing carbon content. The evolution of water from coal in the absence of air is a gradual process, but with certain coals there are temperatures at which the rate of evolution is accelerated. With bituminous coals the first acceleration of moisture evolution coincides with the appearance of oil vapour.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Glasgow Corporation Chemical Works Department.

Sir,—The address by Mr. MacLeod, the Manager of the Glasgow Corporation Chemical Works Department, to the Scottish Junior Gas Association, which is published in your issue of April 27, contains a table of comparative figures purporting to show that the financial results of his Department since its inception have been of substantial advantage to the Corporation. With this object in view, Mr. MacLeod compares the net revenue of his Department with certain figures which he says represent "costs of tar and liquor at arbiter's prices." These figures, however, are altogether misleading, inasmuch as "arbiter's prices" vary in accordance with the terms and conditions of the contracts to which they apply; and the only "arbiter's prices" which can be of any value for comparison with the results of the Glasgow Chemical Works Department, are those which would be governed by the terms of a contract applicable to the Glasgow Corporation.

Prior to the establishment of the Glasgow Corporation Chemical Works Department, there were actual agreements between the Corporation and tar distillers, the terms of which provided for monthly arbitration awards; and it is a simple matter to calculate upon the basis of the last agreement what the Corporation would have realized had they continued to sell their crude residuals to distillers.

If a comparison with these figures is not sufficiently conclusive, it is interesting to compare the results of the Glasgow Chemical Works Department with the prices actually realized by the Edinburgh Corporation Gas Department (as published in "Field's Analysis"), who continue to sell their crude tar to distillers; for I can scarcely believe that the Glasgow Corporation would consider themselves unable to secure as good contractual terms as any other corporation. The following comparative table of prices realized for liquid residuals per ton of coal carbonized is, therefore, a far more accurate guide than are the figures given in Mr. MacLeod's table:

Year.	Actually Realized by Glasgow Corporation Chemical Works Department (see "Field's Analysis").	Prices Based on Last Contract between Glasgow Corporation and Distillers.	Actually Realized by Edinburgh Corporation. (see "Field's Analysis").
	s. d.	s. d.	s. d.
1921 . .	9 11·39	10 9 50	9 4·28
1922 . .	4 3·85	4 11·25	4 8·71
1923 . .	7 8	8 1·25	8 1·46
1924 . .	7 5·91	8 5	7 8·69
1925 . .	5 5·25	5 5·25	5 1·13
Average .	6 11·68	7 6·45	7 0·05

Moreover, the yield of the residuals from the Glasgow vertical retorts was, of course, substantially higher during this period than that from the Edinburgh inclined retorts; the difference in value being certainly not less than 6d. per ton of coal carbonized. Vertical retorts have since been installed at Edinburgh; and the new contract between the Corporation and the distillers provides for this increased yield.

The comparative analysis for 1926 has not yet been published. But in order to achieve the result shown above, the Glasgow Corporation have burdened themselves with a capital expenditure of about £350,000; and it may be observed that the sums set out in Mr. MacLeod's table providing for "interest on the capital value of the works" (approximately 7½ p.ct.) *include* an allowance for sinking fund and depreciation at only 3 p.ct.

Francis Tudsbery.

Lime Wharf Chemical Works,
Falkirk, May 2.

"Developments in Wales."

Sir,—At a meeting of the South Wales District Executive Board of the National Gas Council, held at Cardiff on Thursday afternoon last, the 28th ult., attention was drawn to the statement made in your "Editorial Notes" under the heading "Developments in Wales," in which it is more or less implied that the gas industry in this district is not alive to its responsibilities. I was instructed to write you pointing out that this is far from being the case, as this district is one of the most alive and best organized districts in the industry.

During the coal stoppage last year, our coal supplies were successfully organized for the whole of our members; and this Board received special thanks from the Central Office for the way in which the matter had been handled. This district has always been in the forefront in tackling matters pertaining to the benefit of the industry—even such important questions as amalgamation or joint working. In rating of gas-works, this district was foremost to set-up a special Advisory Committee; and in many other matters it has taken a very active part in looking after the interests of the members and industry generally.

References were also made to the activities of a number of local industrial companies; but there have been no developments of importance to our industry which have not been very carefully scrutinized by the District Board. Such developments, when carefully investigated, have been found to be outside the range of practical financial working; and while glowing reports can be put into print by people interested in such ventures, when the facts come to be discussed reasonable guarantees must be forthcoming as to calorific value, purity, and continuity of supply, otherwise it is futile for gas undertakings to entertain them.

My Board will be obliged if you will publish this letter in an early issue of your valued paper, to eradicate the possibility of any false impression being raised in the minds of your readers.

W. Clark Jackson,
Hon. Secretary, South Wales District Board of the National Gas Council.

Gas Offices,
Mill Lands,
Neath, May 2, 1927.

[It was far from the mind of the writer of the article in question that the gas undertakings in South Wales are not alive to their responsibilities. The contrary is well known. The object of the article was merely to call attention to developments external to the industry, but which concern it.—Ed. "G.J."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Leeds Corporation Bill: Brought from the Commons; read the first time, and referred to the Examiners.

Stoke-on-Trent Corporation (Gas) Bill: Further Standing Orders complied with.

Special Order.

The Special Order to authorize the Crowborough District Gas and Electricity Company to raise additional capital for electricity purposes has been referred to the Special Orders Committee.

HOUSE OF COMMONS.

Progress of Bills.

Bognor Gas and Electricity and Commercial Gas Bills: Read a second time, and committed.

West Bromwich Corporation Bill: As amended, considered, and amendments made.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 27.]

Nos. 10,367—10,958.

Alder & Mackay, Ltd.—"Gas meters." No. 10,738.
Anderson, J.—See Alder & Mackay, Ltd. No. 10,738.
Buxton, R. H.—"Transportation of coke from vertical chambers, &c." No. 10,721.
Croft, C. M.—See Buxton, R. H. No. 10,721.
Gibbons Bros., Ltd.—"Mechanical conveyors for screens." No. 10,385.
Gibbons Bros., Ltd.—"Muffle furnaces." No. 10,687.
Helps, A. M.—"Gas cookers." No. 10,435.
Henshaw, D. M.—"Treatment of gaseous mixtures." No. 10,512.
Holmes & Co., Ltd., W. C.—See Henshaw, D. M. No. 10,512.
I. G. Farbenindustrie Akt.-Ges.—"Manufacture of valuable products from coal." No. 10,480.
I. G. Farbenindustrie Akt.-Ges.—"Production of fuel gas." No. 10,481.
Ingersoll-Rand Company.—"Gas-engine driven air-compressors." No. 10,626.
Marks, E. C. R.—See Ingersoll Rand Company. No. 10,626.
Marle, M. van.—See Gibbons Bros., Ltd. No. 10,687.
Strache, H.—"Arrangement for supplying towns with gas and electric energy." No. 10,958.
Tormin, R.—"Apparatus for carbonizing coal." No. 10,475.
Tormin, R.—"Manufacture of coke." No. 10,476.

MISCELLANEOUS NEWS.

LONDON AND ALDERSHOT ELECTRICITY CHARGES.

At the laying of the foundation stone in connection with the extension of the Aldershot Gas, Water, and District Lighting Company's electricity generating station at the North Camp and Farnborough Works, to which reference was made in last week's issue of the "JOURNAL," Mr. R. W. Edwards, the Chairman and Managing Director, in the course of his remarks, made the following reference to the Company's charges for current as compared with the Metropolis:

COST OF ELECTRICITY.

A few facts from figures published may be of interest in connection with the cost of electricity.

The London County Council has issued for the last time its annual report on Electricity Supply in the London Area, which, commencing with the county alone in 1901, has increased in scope until, since 1919, it has covered the whole of the London and Home Counties Electricity District, embracing a population of over 8 millions. From this report, covering the year 1924-1925, it is revealed that the lighting rates vary between 4d. and 11d. per unit in respect of eight undertakings. Ninety-three lighting charges shown give an average rate of 6·75d. per unit. The table giving flat rates for power contains a record of 74 charges. The lowest is 1d. per unit in three undertakings, and the highest is 7d.; the average rate being 2·8d. per unit. Heating and cooking flat rates number 90. In this case a charge as low as ¾d. per unit is given (summer quarters). Fifteen undertakings have a charge of 1d. per unit. The highest rate is 6d.; and the average of the 90 is 2·07d. per unit.

This Company's charges will be reduced from the Midsummer quarter by ¼d. per unit, which it is anticipated will be the forerunner of sytematic reductions as developments are realized. It will be seen, therefore, even at this stage, that cheap electricity is to be obtainable, governed by the quantity consumed, as the scale of discounts is extended to 50 p.ct. for day-load users, which will bring the minimum charge after midsummer to 1·875d. per unit; and we hope to get this down to 1½d. at an early date. The Company's charges for electricity have been as low as 6d. for lighting and 2d. for heating in 1915—both rates being subject to discounts up to 25 p.ct.—and the prospects of getting back in the near future to these, and even lower, charges are hopeful.

PLANT EFFICIENCIES.

It must be admitted that plant for generating electricity consisting of internal combustion engines as the prime movers has proved to be superior in thermal efficiency. The term "efficiency" means good working with the highest practicable power obtained from the fuel consumed. Thermal efficiency is calculated as a percentage of work done to heat supplied. The internal combustion engine compares very favourably with other prime movers, as efficiencies as high as 30 to 35 p.ct. are obtainable in practice; whereas with the latest steam turbine driven plant the relative thermal efficiency is 25 to 30 p.ct.

LOAD FACTOR.

A further achievement of some importance is the high load factor which is maintained by our electricity station. This is more pronounced during the winter months; but even all the year round we compare very favourably with some of the largest undertakings. To quote figures, the highest weekly load factor for the year 1925 was 48 p.ct.; and for the year 1926, 42·9 p.ct. This is attributable to the collateral and other unseen advantages brought about by unity of working between the various departments of the Company, which will be further retrieved as the use of electricity is extended to the Company's waterworks by the conversion of the steam station and equipment with electrically driven pumping plant.

It may be pointed out, in connection with the above remarks of Mr. Edwards, emphasizing the question of diversified charges and load (of which he is a great advocate), that the report of the Advisory Committee on Domestic Supplies of Electricity and Methods of Charge, appointed by the Electricity Commissioners—see "JOURNAL" for Oct. 27, 1926, p. 214—contains the following paragraph:

> *Form of Tariff.*—The supply of electricity in bulk to authorized distributors will become a feature of increasing importance; and apart from the obvious necessity that such supplies should be provided cheaply, it is essential that the form of tariff for bulk supplies should be such as to make it possible for the distributor to obtain the diversified load upon which the financial success of a bulk supply depends. Bulk supply tariffs, often the subject of long-term contracts, are usually in multipart form, consisting of a kilowatt demand charge and a unit charge, and with or without sliding-scales covering the cost of fuel and/or other items. It is apparent, however, that in some cases these tariffs do not allow the distributor to resell at sufficiently low rates to secure certain classes of business, owing to the unit rate being higher and the maximum demand rate lower than they need be, or to the method or form of the bulk supply charge possessing more rigidity than it is possible for the distributor to secure in his retail transactions with consumers.

Mr. Edwards fully realizes the elasticity possessed by his Company as producers, as compared with the ordinary supply distributor with a bulk contract, such as is mentioned in the paragraph quoted.

BOMBAY GAS COMPANY.

ORDINARY GENERAL MEETING.

The Ordinary General Meeting of the Company was held at the London Offices, Moorgate Station Chambers, E.C., on Wednesday, April 27—Mr. WILLIAM GRAHAM BRADSHAW, C.B.E. (the Chairman), presiding.

The SECRETARY (Mr. A. Dickson, jun.) read the notice convening the meeting and the report of the Auditors; and the Directors' report and the statement of accounts for the year ended Dec. 31 were taken as read.

The CHAIRMAN: Gentlemen, the expectation which was formed twelve months ago of an improvement in the general trade conditions of Bombay has not, I regret to say, yet materialized to any appreciable extent. Indeed, the year 1926, from a trading point of view, was disappointing, and a disastrous one for a large number of traders in Bombay. The trade returns, which for the two previous years, 1924 and 1925, indicated satisfactory improvement in the values of imports and exports, reveal a considerable falling off for the ten months ended Jan. 31 last. The total value of exports for the whole of India shows a decrease of some 20 p.ct. as compared with the same period in 1925; while the imports of foreign merchandise, comparing the same two periods, show an increase of 3·4 p.ct. Taking Bombay alone, the export values have declined by 35 p.ct., as against the all-India figure of 20 p.ct.; and the imports of foreign merchandise have fallen by 5 p.ct., as against the before-mentioned increase for all India of 3·4 p.ct.

INCREASED QUANTITY OF GAS SOLD.

However, notwithstanding these indications of general trade depression, the Company's activities have been maintained in a satisfactory manner. The total quantity of gas sold during the year was 428,889,000 c.ft., being an increase of 60,524,000 c.ft., or 16·4 p.ct., over the previous year. Of this increase, about one-half is accounted for by an adjustment, which was found to be warranted after prolonged tests, of the estimated consumption of gas by the public lamps. Allowing for this adjustment, and comparing the figures on the same basis as the previous year, there is a normal increase of 6·4 p.ct. in the sale of gas, against a decrease of 1·3 p.ct. in 1925, and an increase of 3 p.ct. in 1924. It is encouraging to note that the rate of increase was much larger in the second half of the year than in the first half. The Manager attributes this to the fact that the reduction in the price of gas did not have its full effect in the appreciation of the public until some months after it became operative. The normal increase in the sale of gas for public lamps was 3·9 p.ct. It was mentioned at the last meeting that the price of gas for heating purposes had been reduced by a further 8 annas per 1000 c.ft., from 6s. to 5s. 4d. per 1000 c.ft., as from Jan. 1, 1926. That such reduction has already stimulated the sales of gas is reflected in the returns for the two half-years. In the first half, the increase in the sale of gas for heating purposes was 5·4 p.ct., and for the second half the increase was 20·3 p.ct., compared with the corresponding period of the previous year.

THE ACCOUNTS.

The total expenditure for the year charged to capital account is £9759. The expenditure on new mains is £2950, some four miles of additional mains having been provided. An important feature of the year has been the introduction of machinery for the charging and discharging of the retorts in replacement of the old arduous and expensive method of manual labour. The new plant includes a charging machine, coal conveyors, and coke handling plant; and although it was only in operation during the last three months of the year, it quickly reduced the cost of production. In the current year the saving will be appreciably amplified. The expenditure charged in last year's accounts in respect of this new plant is £5966. The next item of £372 is a new one, and represents the value of cooking stoves which, to further encourage the use of gas for cooking purposes by persons who are unable to purchase the appliance outright, it has been decided to let out on simple hire or hire-purchase terms. The sum expended on new meters is £469. The amount of capital expended in excess of capital raised is now £60,775; and there being no temporary loans, this expenditure has been provided for by the use of the reserve funds in the business.

FIGURES FOR COAL AND RESIDUALS.

In the revenue account, the receipts from gas are more by £418. Public lighting increased by £2235, and private gas rental was less by £1817, due to the reduction in price, although more gas was sold. But for this reduction, the rental would have shown an increase of £4553; the reduction in price representing a saving of £6370 to the consumers. The revenue from the sale of residual products was less by £8844, of which the diminished receipts from coke and breeze amounted to £2678; the average price having further fallen from £2 2s. 0·2d. to £1 4s. 3·8d. per ton. The receipts from the sale of tar are less by £6166; the price per gallon having decreased from 11d. (the highest figure obtained) to 5·04d. This reduction is due to keen competition from the Japanese, who entered the market with big shipments into Bombay, and to obtain sales and capture the business quoted low competitive rates, with the result that we were compelled to reduce our price in order to retain

the market. There does not appear to be much prospect in the future of a return to the favourable prices obtained for our residual products, owing to the dual competition of the Japanese and the Indian coke oven companies. Residuals produced 1s. 4½d. per 1000 c.ft., compared with 2s. 1½d. in 1925—*i.e.*, a loss of 9d. per 1000 c.ft. In total, the gross receipts are down by £8436. On the other side of the revenue account, the expenditure is less by £4555. Coals cost £1741 more; the quantity of coal carbonized being 1642 tons more. The cost per ton of coal carbonized was 35s. 4·5d. per ton, a saving of 10·4d. per ton compared with the previous year. Coal freights were reduced 10 p.ct. last year, resulting in a saving of £1826. The quantity of coal carbonized last year was 28,356 tons; and the sale of gas per ton of coal carbonized amounted to 15,003 c.ft. On the normal basis, without taking into account the adjustment of the estimated amount consumed in the public lamps, this would be 13,505 c.ft. per ton, compared with 13,575 c.ft. per ton in 1925. The net cost of coal, after deducting receipts from residuals, was 11·2d. per 1000 c.ft., against 6·1d. in 1925, an increase of 5·1d. per 1000 c.ft. Repair and maintenance of works is less by £1745; and distribution charges are also less by £770. The cost of lighting and repairing public lamps is more by £349; there being a larger number of lamps on the district. Rents, rates, and taxes are less by £139. Management and general charges are less by £2412. In 1925 £1000 duty on increased capital was charged, and £800 for the new showroom. Setting the reduced expenditure of £4555 against the reduction of £8436 in total receipts, the profit on the year's trading is less by £3881. In view of the depressed condition of trade in Bombay, it is satisfactory that the losses from bad debts remain at the low level of 0·01 p.ct. of gross receipts.

Result of the Year's Working.

In the net result of the year's work the balance of profit carried to the net revenue account is £21,700. There is a profit on exchange of £5122, which is £2295 less than in 1925, mainly owing to smaller remittances. The average rate of exchange of the rupee was 1s. 5·95d., against 1s. 6·08d. in 1925. Adding this and interest £360, there is a net profit of £27,183 for the year. The undivided profit brought forward from the previous year of £40,576 brings the total available profit up to £67,759. Deducting from this the interim dividend of £12,000 paid in November last, and the customary additions to the reserve funds, which together amount to £2954, there remains £52,805, out of which a final dividend of 4 p.ct. is recommended, making 8 p.ct. for the year, and leaving £40,805 to be carried forward to the current year, which is £229 more than was brought in. This is a result which, taking into consideration the adverse trade conditions to which I have already alluded, may be deemed to be satisfactory.

Future Prospects.

With regard to future prospects, Sir Joseph Kay, the retiring President of the Bombay Chamber of Commerce, at the annual meeting of the Chamber held last month, said, in his opening speech: "As to the future, I see clear signs of better times ahead, for already this year dealers and consumers are operating with more freedom, and stocks which had accumulated have in the main been disposed of; and though I do not predict anything in the nature of a trade boom, I look forward to the immediate future with some confidence." Moreover, our General Manager, Mr. Lane, reports that there are indications of improvement in the textile industry, though it is difficult to say if it is of a temporary or permanent nature. The building trade is not active; and the population is somewhat depressed, owing to large numbers of men and women engaged on big schemes having been dismissed. In spite, however, of these disadvantages, the Company continues to make satisfactory progress, which is indicated in the monthly returns for the current year. These show that the increased sales of gas during the latter half of last year are being well maintained. A hopeful feature of the situation is that, owing to the demands for heating appliances, our fittings department is working up to its full capacity. This activity is attributable in large measure to the attractive appliances exhibited in our new showroom, and to the hire and hire-purchase systems recently inaugurated. To enable the Manager to cope with the larger output of gas, it has been decided, on his recommendation, to add to the works plant by the provision of a new gasholder of a capacity of 1½ million c.ft., and to make other necessary additions to the manufacturing plant. When these additions have been carried out, the Company will be in a strong position to take advantage of the increased business which an improvement in the trade of the city would undoubtedly bring. All that is required is an abundant supply of cheaper coal than we are getting at present, to enable us to reduce the cost of gas and to sell it at a popular price, when our Manager assures us that gas will be looked upon as an universal fuel and an absolute necessity. The cloud upon the horizon is the depressed state of the market for coke and tar, where we have the competition of which I have already spoken, and which is not, I fear, likely to be abated. Our General Manager assures us that all attention possible has been given to maintaining the works and plant in a high state of efficiency. Many minor improvements have again been made, in addition to the installation of retort machinery, electric generating plant, coal and coke handling plant, and a double railway track for handling the coal from the railway siding to the coal stores.

Loyalty of the Staff.

In his annual report, Mr. Lane writes: "The whole staff, from the management down to the most humble coolie, are doing their utmost to assist towards increasing the business and prosperity of the Company. They all feel that they are working for a live and go-ahead Company; and they believe that the shareholders may give their confidence and support to their investment." I think you will agree that evidence in support of Mr. Lane's statement regarding the staff is to be found in the report and accounts before you; and I have much pleasure in saying that, judging from personal contact with members of the European staff when they are home on furlough, and from frequent correspondence with Mr. Lane and the Company's Auditors in Bombay, I have no doubt that his encomiums are fully deserved. In Mr. Lane we have an able and experienced General Manager and Engineer, who brings to bear upon the business of the Company an intimate knowledge of the requirements of Bombay. He is devoted to the interests of the Company, and believes that it has a great future before it. He has given the best years of his life to its service; and he deserves great credit for his successful conduct of its affairs in difficult and exacting circumstances. I can say from personal experience of the work of Mr. Dickson and his staff at the London Office, that it is well and ably done. My confidence in them, which has existed for many years, increases as the days go by. I believe that the Company is admirably served both at home and in India; and I am sure that you will have pleasure in expressing the same opinion when the time comes to pass a resolution to that effect.

It is now my duty to move:

> "That the report of the Directors and the statement of accounts for the year ended Dec. 31, 1926, now submitted, be, and the same are hereby, received and adopted."

The Deputy-Chairman (Mr. H. H. Macleod) formally seconded the resolution.

The Chairman, replying to questions by shareholders, said the Company converted the rupee at 1s. 4d.; and the Board had not yet considered the matter of its stabilization at 1s. 6d. The Directors would think over a suggestion that, as the Japanese had very good gas making coal, it might be possible, by taking some of this, to induce that country not to ship coke and tar to Bombay.

The motion was then put to the meeting and carried unanimously.

The Final Dividend.

Proposed by the Chairman, and seconded by Mr. Stanley H. Jones, it was agreed:

> "That a final dividend for the year ended the 31st of December, 1926, of 4 p.ct. (less income-tax at the rate of 2s. in the pound) be now declared payable on and after the 2nd of May, 1927, making with the interim dividend of 4 p.ct. a dividend of 8 p.ct. for the year."

The Chairman remarked that, before proceeding to the re-elections, he would like to say how much the Directors regretted the absence from the meeting through the indisposition of Mr. A. M. Paddon, who was a most valuable colleague.

Re-Elections.

The Deputy-Chairman said the Company had always been peculiarly fortunate in its Chairman; and Mr. Bradshaw, whose re-election as a Director it was his pleasure to move, was worthily carrying on the old tradition. He was a pillar of strength to the Company; and they trusted he would be spared for many years to give them the benefit of his great ability and energies.

Mr. Stanley Jones seconded the proposition, which was carried unanimously.

The Chairman then moved the re-election as a Director of Mr. Stanley Hunter Jones, M.Inst.C.E. He said he had been for many years a colleague of Mr. Jones, and could testify to his expert knowledge of gas manufacture and distribution, and to the great value that his presence on the Board was to the Company.

The Deputy-Chairman seconded the motion; and it was agreed to.

On the proposition of Mr. Bertram Ellis, the Auditors (Messrs. Spencer Gore-Browne and Mr. Alfred Morland, F.C.A.) were re-appointed.

Vote of Thanks.

Moved by Mr. Aschwanden, a hearty vote of thanks was passed to the Chairman, Directors, officers, and staff in London and Bombay, for the excellent manner in which they had conducted the affairs of the Company during the past twelve months. He said the shareholders felt perfectly safe in the hands of such efficient gentlemen.

The motion being duly seconded, and carried with acclamation,

The Chairman returned thanks on behalf of himself and his colleagues on the Board. The Company, he said, was in a sound and satisfactory condition, and he believed there was a prosperous future in store for it.

The Secretary also acknowledged the vote on behalf of Mr. Lane, himself, and the staffs and employees in London and Bombay. While it was true that they had been through difficult times during the past twelve months, he felt that there was promise of better things to come, and that this year would prove to be better than the last. The sale of gas for the first three months of the current year had been 8 p.ct. in excess of that of the corresponding period of 1926; and Mr. Lane had written by the last mail that he had every confidence in this rate of increase being maintained over the remaining nine months of the year.

A CELEBRATION DINNER.

An interesting meeting took place on Saturday, April 23, when the Sheetmetal Workers of Messrs. Willey & Co., Ltd., from Exeter met their fellow workers of the firm's London Branch, and had dinner together at the Talbot Restaurant, London Wall, E.C. About 160 were present. The chair was taken by Mr. Thornton Willey (Director), who was supported by Mr. T. A. W. Parsons (Manager, Exeter), Mr. W. J. Steer (Manager, London), Mr. A. Woollcott (Foreman, Exeter), and Mr. Hertz (Foreman, London).

Mr. Willey proposed the Loyal Toast; and this having been honoured, he expressed his pleasure in accepting the invitation extended to him to take the chair.

Mr. Steer proposed the health of the visitors; and Mr. Parsons responded on their behalf.

The rest of the evening was given up to songs and entertainment. At the close, Mr. W. J. Bickham (Shop Secretary of the London Branch Meter Works) expressed the delight of his friends in London at meeting the Exeter men. To this Mr. L. G. Sprague (Shop Secretary of Exeter Meter Works) responded.

INSTITUTION OF GAS ENGINEERS' EXAMINATIONS.

The following questions were set in the examinations in Gas Engineering and Gas Supply which were held on April 30 under the Education Scheme of the Institution of Gas Engineers. The Examiners were, for Gas Engineering, Messrs. H. D. Madden, M.Inst.C.E. (Cardiff), W. J. Smith, B.Sc. (Bolton), H. C. Smith, Assoc.M.Inst.C.E. (Tottenham), John Terrace, M.Inst.C.E. (London), and J. Stanley Thorman (London); and for Gas Supply, Messrs. S. B. Chandler, A.M.Inst.Mech.E. (Tottenham), Stephen Lacey, B.Sc. (London), John P. Leather, M.Inst.C.E. (Letchworth), and A. B. Roxburgh (Newcastle-on-Tyne).

GAS ENGINEERING.

ORDINARY GRADE.

From 2 to 5 p.m.

Sketches may be adopted to obviate long and involved statements. The general neatness of the paper, including that of the sketches, and the lucidity of expression, will be taken into consideration in assessing marks.

(Eight Questions set; six only to be attempted.)

1. Sketch and describe any well-known form of mechanical scrubber used for the removal of ammonia.

2. Describe how you would ascertain the quantity of ammonia present

(*a*) in coal gas,

(*b*) in ammoniacal liquor,

and state briefly the difference between " free " and fixed ammonia.

3. (*a*) Explain and give the equations representing the reactions which take place in the gaseous fired producer of a horizontal retort setting.

(*b*) What is the approximate composition of a good producer gas?

4. Describe with the aid of sketches the plant used for the manufacture of carburetted water gas, and explain the method of working.

5. (*a*) What would you expect to find the calorific value of

(1) blue water gas,

(2) carburetted water gas containing 1·5 gallons of oil per 1000 c.ft.?

(*b*) State the percentages of the various component gases in the blue water gas.

6. Sketch an arrangement of five oxide of iron purifiers showing the necessary connections, and describe the method of working you consider best.

7. Describe with the aid of sketches giving approximate dimensions any form of horizontal retort setting with which you are familiar.

What weight of coal per retort per 24 hours would you expect to carbonize in the setting you describe?

8. Describe in detail the test for ascertaining the quantity of sulphur compounds in gas, and give a sketch of the apparatus used.

GAS ENGINEERING.

HIGHER GRADE.

Part I., from 2 to 5 p.m.

(Five Questions set; four only to be attempted.)

1. Sketch an arrangement for a setting of eight horizontal retorts (four tiers), showing combustion chamber and the upper portions only of producer arch and secondary air and waste gas flues.

Mark thereon the temperatures in Centigrade you would expect to obtain in general daily carbonizing practice.

2. Describe the conditions you would examine in horizontal retort carbonizing practice to obtain the best all-round results in gas, tar, coke, &c., from the coal available, and state the tests you would employ, and reasons for same.

Explain the effect of temperature on the tars and hydrocarbons produced.

3. Describe by sketch the flue and general arrangements connecting a waste-heat boiler to an installation of vertical retorts (part only of the retort setting need be shown).

Give particulars of the inlet and outlet temperatures of the waste gases, and chemical compositions of same with special reference to the CO_2 content, and its relationship to waste gases leaving the top of the retort setting.

4. Describe fully the processes of

(*a*) condensation,

(*b*) washing and scrubbing.

What functions does each process perform? Give reasons for the employment of same.

5. Describe *fully* the process of dry purification by oxide of iron (preparation and treatment of material also), and give the chemical equations occurring in the vessels and in revivification.

How would you test the boxes to ascertain the position of the H_2S? What strength of sulphur would you expect to find when the oxide is fully spent?

Part II., from 6 to 9 p.m.

(Five Questions set; four only to be attempted.)

6. Sketch a cross-section of a brick and puddle gasholder tank, showing inlet and outlet pipes and the arrangements for supporting the crown sheeting of an untrussed gasholder.

7. Enumerate in order the vessels of a carburetted water gas plant, and describe the construction and functions of each in the gas-making process.

Describe a method for utilizing the waste heat of this plant for steam raising.

8. Sketch a cross-section of any saturator with which you are familiar, and briefly describe the process of the manufacture of sulphate of ammonia, stating how the fixed and free ammonia is liberated from the ammoniacal liquor.

How can the freshly-made sulphate be neutralized and dried? Give your reasons for these latter processes.

9. Explain the methods you would adopt to test a sample of coal for (*a*) moisture, (*b*) sulphur, (*c*) ash, (*d*) calorific value.

10. Explain by aid of a sketch, the general construction and connection of a station meter.

What corrections are made on the volumes of gas registered? Explain in the widest sense the necessity and reason for this.

What points have to be regularly watched to ensure accuracy and smooth working of a station meter in daily operation?

DIPLOMA.

Part I., from 2 to 5 p.m.

(Five Questions set; four only to be attempted.)

1. Describe the method of cleaning coals for the removal of free ash before the coals are carbonized.

Review the advantages and disadvantages of such a process.

If coals free from moisture were carbonized, explain the reason for virgin liquor obtained, together with the chemical data explaining its formation.

2. Describe a method for removing scurf from vertical retorts without letting down the retort and scurfing by hand, which is the usual custom, stating the advantages claimed for such a method.

3. Describe, with sketches, two different types of grate for retort house producers, and state which type you would recommend, giving your reasons.

Give the analysis of producer gas, and its calorific value, which you would expect to obtain from a well-designed producer, stating the depth of fuel that you consider necessary.

What precautions would you take to improve the quality of producer gas?

4. What apparatus would you instal in a retort house for the best control of its working? Describe the object of each piece of apparatus, and state in what respect it should help in obtaining the maximum efficiency.

5. If, in the design of a carbonizing installation, there was a question of whether to instal waste-heat boilers or regenerators, state which you would select, giving your reasons.

State the amount of steam you would expect to produce per ton of coal carbonized from waste heat, in waste-heat boilers, with and without regenerators, giving the combustion chamber temperature and the CO_2 content of the waste gases at inlet and outlet of regenerators.

Part II., from 6 to 9 p.m.

(Five Questions set; four only to be attempted.)

6. What method would you recommend for the generation and distribution of power on a modern gas-works? Give your reasons for your recommendation.

In a works using principally steam for power, state the losses you would anticipate in its distribution, and describe in detail the method that should be adopted to reduce to a minimum such losses.

7. Describe with sketches the latest type of carburetted water gas plant, showing the most modern labour and heat saving appliances, and the latest modifications in methods of working to obtain the greatest efficiency.

What precautions would you take to reduce to a minimum the coke consumption per thousand in the generators?

8. Describe, with sketches, the various methods to adopt for foundations for heavy buildings or plant on gas-works.

State the conditions prevailing, under which you would recommend pile foundations, and the test to which you would subject a pile to carry 2 tons per sq. ft.

What is the maximum load per sq. ft. you consider varying virgin ground would carry without subsidence? State the nature of the virgin ground referred to.

9. Describe, with sketches, three well-known types of charging and discharging machinery for horizontal retorts. State which type you would recommend, with your reasons, giving its advantages and disadvantages.

10. Describe, by means of a sketch, a tankless gasholder. Compare capital cost per million c.ft. with other types of gasholder that you would specify.

State generally the advantages and disadvantages of tankless gasholders.

GAS SUPPLY.

ORDINARY GRADE.

From 2 to 5 p.m.

Sketches may be adopted to obviate long and involved statements. The general neatness of the papers, including that of the sketches, and also lucidity of expression, will be taken into consideration in assessing marks.

(Eight Questions set; six only to be attempted.)

1. The atmospheric pressure varies (say) from 29 to 31 in. of mercury. Express that difference in terms of inches of water and pounds per sq. in., and explain clearly why it is that such variations in the atmosphere pressure do not affect the pressure of gas (as measured by a **U** gauge) in a distributing system.

2. Compare the relative merits of wrought iron and compo. for pipes used for house carcassing. Give the approximate composition of compo. pipe.

3. Define unaccounted-for gas. State the main factors that make it up, and describe briefly the various means that may be taken to reduce it.

4. Make a sketch of the interior of a dry gas meter, and explain the functions of its moving parts.

5. In modern cooker design the flue outlet of the oven is placed sometimes at the top, sometimes at the bottom. What is your view of the relative merits of these two methods? Give your reasons.

6. What thermal efficiency would you expect to obtain from a boiling burner on a well-designed hotplate of a gas cooker? With this thermal efficiency, how many cubic feet of gas (480 B.Th.U. per c.ft.) would be required to raise 3 pints of water from 50° Fahr. to boiling-point?

7. Sketch a modern gas fire burner, and describe the purpose of every part.

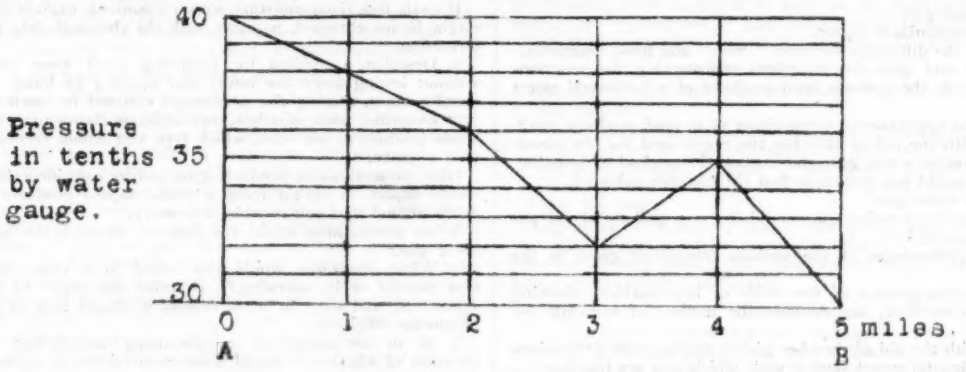
8. Describe what you would consider it necessary to do to a gas-heated circulator that had been in use for about a year, to ensure its being left in an efficient and satisfactory condition.

HIGHER GRADE.

Part I., from 2 to 5 p.m.

(Six Questions set; five only to be attempted.)

1. Two points, A and B, five miles apart, are connected by a trunk main of uniform diameter throughout. There are no connections to the main en route. Gas is flowing in the main from A to B, and the distribution of pressure throughout the length is as shown by the accompanying diagram. Points A and B are at the same level—viz., 100 ft. above datum.



QUESTION 1 (Higher Grade, Supply).

Calculate the height of the main above datum at points three and four miles from A. The specific gravity of the gas is 0·22, and for the purpose of this calculation water should be taken to be 800 times heavier than air.

2. According to Pole's formula, the rate of flow of gas in a pipe varies directly with the square root of the loss of pressure and with the square root of the fifth power of the pipe diameter; the rate of flow also varies inversely with the square root of the specific gravity of the gas and the square root of the length of the pipe.

By what percentage would the rate of flow be changed if the other factors in Pole's formula were increased as follows:

Loss of pressure	30 p.ct.
Diameter of pipe	20 ,,
Length of pipe	50 ,,
Specific gravity of gas	10 ,,

Also determine the percentage change in the rate of flow if the percentage variations specified above were decreases instead of increases.

3. The *average* hourly rate of gas consumption in a distribution system expressed as a percentage of the *maximum* hourly rate has been called the "load factor."

Discuss the effect upon the "load factor" of the changes in and extensions of the uses of gas in the last thirty years, and explain the significance of the "load factor" in relation to the cost of distribution.

4. Make a sectional sketch of a mercury sealed district governor. Explain clearly how the governor reacts to variations in inlet and outlet pressure respectively, and show by an example how you would determine the weight that must be added to the bell to increase the outlet pressure by five-tenths.

5. Describe and compare the circumstances in which the following are particularly suitable in gas distribution: (*a*) Fan, (*b*) turbo blower, (*c*) positive rotary pump, (*d*) reciprocating pump.

Also, discuss the considerations you would take into account when deciding the method of driving in each case.

6. The sketch shows diagrammatically in elevation the general arrangement of the carcass in a small house having a ground floor and first floor. If you were allowed to carcass such a house in accordance with the best practice, what size pipes would you use in the various parts, and what pressure would you expect to find at points A, B, C, D under the following conditions:

(1) When all the appliances are fully working;
(2) When the geyser and cooker alone are working;
(3) When no gas is being consumed.

You are not required to make calculations, but explanatory remarks would add to the value of your answer.

HIGHER GRADE.

Part II., from 6 to 9 p.m.

(Six Questions set; five only to be attempted.)

1. The combustible constituents of town gas include hydrogen, carbon monoxide, and methane.

Give chemical equations representing the complete combustion of these gases, and show that the volume of air required for combustion of each is nearly proportional to their calorific values per unit volume.

The following data should be used:

B.Th.U. evolved by combustion of 1 lb. of hydrogen 61,500; carbon monoxide 4370; methane 24,000.

Density of hydrogen, 5·89 lbs. per 1000 c.ft.

2. Present practice in street lighting includes two main types—viz., low candle-power units on posts 11 to 14 ft. high; and fewer high candle-power units on posts 15 to 25 ft. high.

Describe fully the practical, economic, and photometric aspects of these alternatives.

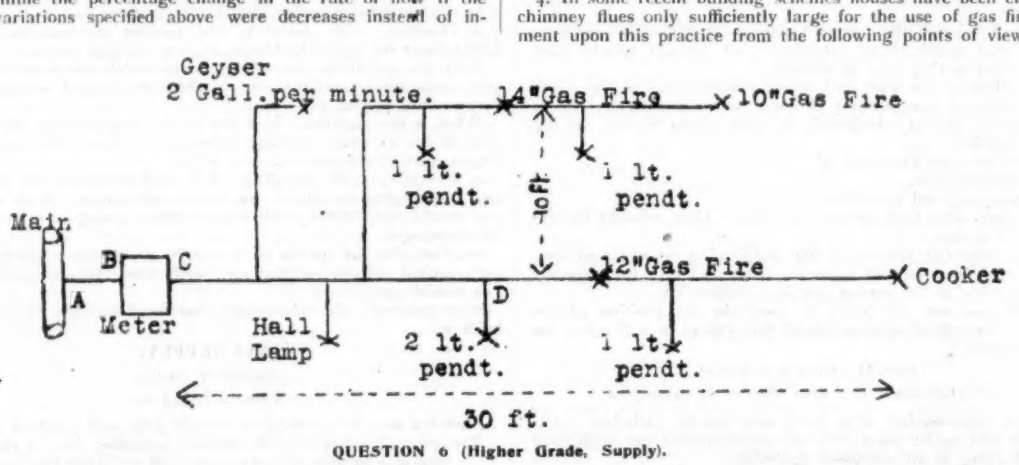
Diagrams would add to the value of your answer.

3. Discuss the uses of gas and coke for the provision of hot water and partial central heating in private houses.

In what circumstances would you think it desirable to instal both a gas and a coke boiler?

Explain by a sketch how you would connect the two systems.

4. In some recent building schemes houses have been erected with chimney flues only sufficiently large for the use of gas fires. Comment upon this practice from the following points of view:



QUESTION 6 (Higher Grade, Supply).

(*a*) Adequate removal of products of combustion, and the ventilation of rooms.
(*b*) Economy in building materials.

5. Draw polar curves showing the distribution:
(*a*) Of radiant heat from a gas fire you are familiar with.
(*b*) Of light from an unshaded 3-light cluster lamp with medium sized mantles.

Explain, and show diagrammatically, how both these curves can be modified by the use of reflectors.

6. State the causes and results of incomplete combustion. Your answer should include the consideration of water heaters, gas fires, and gas cookers, and a short statement of the instructions you would give to fitters about to undertake maintenance of these appliances.

KIRKE PATENT WASTE HEAT BOILERS

have been installed at gasworks in the following places on

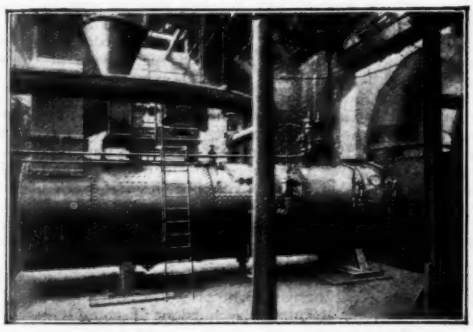
Horizontal Retorts

BECTON, BOXHILL, N.S.W., BRECON, BRIGHTON & HOVE, BROMLEY (repeat), CROYDON, KNOWLE, OMORI (Japan), PORTSMOUTH, RETFORD, STRATFORD, E., STRETFORD, TOTTENHAM (two repeats), WELLINGBORO'.

and on

Inclined Retorts

BURNLEY and BRENTFORD.



Up to 5¾ lbs. of Steam per lb. of Coke put into the Producers have been obtained from Non-Regenerative Horizontal Retorts by means of these Boilers.

Up to 4 lbs. of Steam per lb. of Coke put into the Producers have been obtained from Regenerative Horizontal Retorts by means of these Boilers.

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COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

There is no improvement to report on this market. Conditions remain dull, and prospects gloomy. The ascertainments have been published, governing wages payable in May, based upon working results in March, and in both Northumberland and Durham the rate which would be economically payable falls well below the minimum percentage, by which the men are protected. Since the month of March, conditions certainly have not improved, and, in fact, in Northumberland prices are lower by several shillings.

From the Continent, reports show that determined efforts are being made to exclude, as far as possible, the import of English coal into Germany; and both the Government under their licensing system, and the Coal Syndicate with their price policy, appear to be working to this end. The French Government, too, are doing all in their power to restrict coal imports, and importers are in conference this week in Marseilles to consider what can be done, with representatives from this market in attendance.

Everywhere the keenest competition is encountered from other producers, who seem to be able to market coal at considerably lower figures than our own. Inquiry has been coming forward more steadily; but business is extremely difficult to fix, even at to-day's low prices. The prospects for this district, which is so largely dependent on export, are regarded locally with great anxiety.

The better quality gas makes are fairly steady at recent levels, Wear Specials asking 17s. 6d. f.o.b., and best qualities being quoted at 17s. to 17s. 6d. Seconds are freely offered at 15s. to 15s. 6d. Durham unscreened coking is weak at 15s. to 15s. 3d., and bunkers are freely offered at 15s. f.o.b., with 15s. 6d. to 16s. 6d. for better sorts, according to place of shipment. Northumberlands are still in slow demand, even at the absurdly low figure of 14s. 6d. for best screened steams. Gas coke for shipment is offered at 21s. 6d. to 22s. 6d. f.o.b.

YORKSHIRE AND LANCASHIRE.

Gas coals in Yorkshire and Lancashire are being negotiated for forward twelve-month contracts, at various prices; there being no apparent unity, as in previous years, among collieries as to a basis of selling.

The export market shows no improvement.

The shorter working hours have resulted in steam and coking smalls—especially the latter—becoming firmer; and these commodities are quoted at an increase compared with prices a few weeks ago.

It is rather difficult to understand why the better grades of washed fuels are so plentiful at prices much lower than the pre-stoppage basis. It appears on the face of it that the large consuming industries show no signs of the anticipated improvement in their respective branches of trade.

The slightly-increased demand for domestic coal which obtained last week has not been maintained, and, in consequence, collieries are in the majority of instances not working full time. Prices have declined in accordance with the position at each particular point.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 19s. 6d. to 19s. 9d.; screened gas coal, 19s. 6d. to 20s.; washed trebles, 19s. to 20s.; washed doubles, 18s. 3d. to 18s. 9d.; washed singles, 18s. to 18s. 6d.; washed smalls, 16s. 3d. to 16s. 6d.; unwashed doubles, 17s. to 17s. 6d.; rough slack, 14s. to 15s.; smithy peas, 19s. 6d. to 20s. 6d. per ton. West Yorkshire—Hartleys (f.o.b. Goole), 16s. 6d. to 17s. 6d.; screened gas coal, 17s. 6d. to 18s. 6d.; washed trebles, 17s. 6d. to 18s. 6d.; washed doubles, 17s. 6d. to 18s.; washed singles, 17s. 3d. to 17s. 9d.; washed smalls, 16s. to 16s. 6d.; unwashed trebles, 17s. to 17s. 6d.; unwashed doubles, 16s. to 17s.; rough slack, 14s. to 14s. 6d. per ton. Derbyshire and Nottinghamshire—Top hards, 21s. 6d. to 22s. 6d.; washed trebles, 19s. to 20s.; washed doubles, 18s. 3d. to 18s. 9d.; washed singles, 18s. to 18s. 3d.; washed smalls, 15s. 6d. to 16s.; unwashed doubles, 17s. to 18s.; rough slack, 14s. 6d. to 14s. 9d. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 16s. 6d. to 19s.; gas coke, 24s. to 27s. 6d.; furnace coke, 25s. to 26s. per ton.

MIDLANDS.

There is no indication of any expansion in the consumptive demand for industrial fuel. The house coal branch with the advance of the season yields a smaller turnover every week. As nobody will entertain the idea of stocking, employment at the pits is decreasing. If some collieries have relatively good order books and are able to do a full week's work they are profiting at the expense of their neighbours. Three to four days' work a week represents a good average now.

Competition is bringing prices down. The retrogression is irregular, however, and this helps to steady the market. Steams are now making 17s. to 18s. at the pithead. Good sized nuts fetch about 14s. to 15s., and D.S. nuts 12s. to 13s. Slacks are firm at 9s. to 11s. The lower output of household coals tends to equilibrium in smalls and slacks.

Negotiations with regard to new contracts for gas coal have made no tangible progress. Gas undertakings are well covered for the present by balances due on the old contracts, which are being regularly delivered. If there is any deficiency, spot lots can be bought at 16s. or 17s.

Smelters have not succeeded in breaking the prices collectively quoted for hard cokes. It is said that some concessions have been obtained from cokeries which do not own allegiance to the Association; but the effect is limited thus far. Associated ovens still require 22s. on rail for the second quarter's contracts, and for occasional consignments from 6d. to 2s. more is demanded.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *May* 2.

There is still a little amount of business in pitch being done for this season's shipment, and the market is steady at about 75s. to 80s. per ton. For next season, business also is possible at a very small discount.

Creosote continues firm at about 8¾d. to 9d. per gallon.

Pure toluole is a little easier at 1s. 11d. to 2s. per gallon. Pure benzole is about 1s. 9d. per gallon, and solvent naphtha is about 1s. 6d. to 1s. 7d. per gallon for 95/160 quality.

The demand for phenol continues, and the value is not below 9d. per lb. in large drums and overcasks.

Tar Products in the Provinces.

May 2.

The average values of gas-works products during the week were: Gas-works tar, 57s. 6d. to 62s. 6d. Pitch—East Coast, 75s. to 80s. f.o.b. West Coast—Manchester, 72s. 6d. to 79s. 6d.; Liverpool, 75s. to 80s.; Clyde, 77s. 6d. to 80s. Benzole, 90 p.ct. North, 1s. 5d. to 1s. 6d.; crude, 65 p.ct. at 120° C., 1s. 0¼d. to 1s. 0⅜d., naked at makers' works; 50-90 p.ct. naked, North, 1s. 6d. to 1s. 7d. Toluole, naked, North, 1s. 6½d. to 1s 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; saltv, 7¼d. to 7½d; Scotland, 7½d. to 7⅝d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 6d. prompt. Naphthalene, £11 to £14; salts, 100s. to 110s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

TRADE NOTES.

Extensions at Stourbridge.

The Stourbridge Town Council have accepted the tender of the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for an extension of the vertical retorts at the gas-works.

"Simplex" Water Gas Plant.

The Vertical Gas Retort Syndicate, Ltd., of 17, Victoria Street, Westminster, S.W., have received an order from the Oxted and Limpsfield Gas Company for an improved "Simplex" water gas plant.

"W.-D." Verticals for Aberystwyth.

On the advice of their Engineer and Manager, Mr. J. Gaunt, the Aberystwyth Gas Company have placed an order with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for a Woodall-Duckham continuous vertical retort plant, comprising eight unit retorts having a total carbonizing capacity of 40 tons per day. The installation is complete with coal breaker and elevator, producer coke hoist, and waste-heat boiler of the vertical type.

CONTRACTS OPEN.

Retort House Extensions and Plant.

Tenders are invited for the above by the Ormskirk Gas Company. [See advert. on p. 318.]

Pipes, Shovels, Forks, Fittings, Lamps, Mantles, &c.

Tenders for above and other stores are invited by the Gas Committee of the City of Leeds. [See advert. on p. 318.]

Coal.

Tenders are invited by the Workington Corporation Gas Committee for the supply of gas coal. [See advert. on p. 318.]

Valves.

The Gas Department of the County Borough of Plymouth are inviting tenders for the supply of gas valves, &c. [See advert. on p. 318.]

Pipes, &c.

The Sidmouth Urban District Council are inviting tenders for the supply of cast-iron mains and connections. [See advert. on p. 318.]

A Fine Family Record.—The recent death of Mr. Thomas Walton, of Longport, at the age of 80 years, has broken what must be a unique record of public service. The late Mr. Walton had been employed by the Stoke-on-Trent Gas Department at the Longport Works for 54 years. Mr. John Walton has served the Department for 42 years; another son, Mr. Harry Walton, for 41 years; and a grandson, Mr. Harry Walton, for 16 years. This is a total of 153 years' service to the Department by one family, with three still serving. It was a proud boast of the late Mr. Thomas Walton that he had never been late for work; and he was engaged upon his duties less than a week before his death.

Gas Prices at Halifax.—The Halifax Corporation Gas Committee propose, subject to the Town Council's approval, that from the meter readings for March the fixed charges for gas supplied under the alternative to the standard requirement system be reduced by one-third, and that for commercial and industrial supply the present charge of £2 per I.H.P. be reduced to £1 6s. 8d. per annum for every 20 c.ft. in the maximum hourly demand. The charges will be: Within the borough, for the first 400 therms per month, 6d. per therm (7½d. outside the borough); all gas used in excess of 400 therms per month, 3½d. per therm (outside, 5d.). The present special advance of 12½ p.ct. on all gas and fixed charges remains in force.

Oriental Gas Company's Dividend.—The Directors of the Oriental Gas Company, Ltd., have resolved to pay, on May 31, an interim dividend at the usual rate of 3½ p.ct., less income-tax, on account of the year ending on the 30th of June next.

South African Lighting Association Dividend.—The Directors of the South African Lighting Association, Ltd., have resolved to pay a dividend of 3 p.ct., less income-tax at 2s. in the pound, for the year ended Dec. 31, 1926; such dividend to be payable on the 18th inst.

Successful Stock Issue at Lewes.—The issue of £15,000 of additional capital stock in the Lewes Gas Company, tenders for which were invited by Messrs. A. & W. Richards on behalf of the Directors, was over-subscribed, at prices ranging from £110 down to the minimum of par.

Cheaper Gas at South Shields.—The Directors of the South Shields Gas Company intimate that the price of gas is to be reduced to 10d. per therm for the inside area and 10·8d. per therm for supplies in the outside area, to take effect as from the last reading of the meters.

Waterless Gasholder Company, Ltd.—A Company has been registered, with a capital of £5000 in £1 shares, to negotiate for and acquire the rights and concessions for the manufacture, erection, or working of gasholders in any part of the world. The Directors are Mr. J. Le Boutillier, Dr. O. Gertung, and Mr. J. L. Chaloner.

Manufacture of Gas Appliances in Australia.—We understand that the Parkinson Stove Company, Ltd., whose manufactures have for some time past been in increasing demand in Australia, are commencing the manufacture in Australia of cookers, fires, and other gas-consuming appliances, through their subsidiary, the Parkinson Stove Company (Australia), Ltd. Mr. D. M. Gibb, the General Manager and a Director of the first-mentioned Company, and also a Director of the subsidiary Company, is now in Australia for the purpose of inaugurating manufacture there.

Low Price of Plymouth Gas.—The case for the gas companies was well put by Mr. G. Bolton, Secretary of the Plymouth and Stonehouse Gas Light and Coke Company, in the course of an interview recently. "When the coal stoppage started in May," he said, "we had stocks of coal to last us for three months. When these were exhausted we had to buy foreign coal at greatly enhanced prices, but the price of gas was not raised until September, when it was fixed at 7½d. per therm. The stoppage continued; and we were forced to increase the charge to 9d. per therm at Christmas. The cause of the heavy bills at Lady Day is the increase in price fixed at Christmas, and also an increase in consumption. The gas consumed is paid for at least three months later; and the consumer is paying now for the higher charge which had to be imposed at Christmas owing to the high price we had to pay for coal. The first cargo of English coal we were able to obtain after the dispute, which ended in November, was delivered in the first week in January; and it was, of course, dearer than pre-stoppage coal. In addition, the quarter which has just ended has been colder than usual. Gas fires have been burning much more often; and they consume a great deal of gas. Indeed, the cost of lighting is very small compared with the cost of fires and stoves. In regard to the suggestion that the Company have increased the pressure, and so forced a much larger amount of gas through the burners, I should like to point out that the householder can always control the pressure himself, for a tap is provided for the purpose. The Company, however, have not increased the pressure at all. It has been the same as during the corresponding quarter of the previous year. The coal stoppage cost us £50,000, but in spite of this gas will be reduced to 7·3d. per therm this quarter. Plymouth still ranks as one of the half-dozen cheapest towns in England as regards the price of gas."

The price of gas in Birnam has been lowered, as from May 1, by 10d. per 1000 c.ft.; thus bringing it back to the price before the coal strike.

The Directors of the Aldershot Gas, Water, and District Lighting Company have approved that the Annual Joint Festival of the Co-Partnership Scheme and Hospital and Benevolent Fund shall take place on Saturday, July 23, on the Sports Ground, Ash Road, South Works.

Mr. George Green has retired from the service of the Birmingham Gas Department, after 36 years there; and at a meeting of the Department on Tuesday last he was presented with a wireless set subscribed for by 120 of his fellow workers. The presentation was made by Mr. R. J. Rogers, Chief Superintendent of the Fittings Department.

The Halifax Corporation Finance Committee have appointed a Special Sub-Committee—comprising the Mayor, the Chairmen and Deputy-Chairmen of the Gas, Electricity, and Finance Committees, and two other councillors—to examine the respective spheres of influence of the Gas and Electricity Departments, and to report to the Finance Committee.

It was reported at a meeting of the Plymouth Corporation Gas Committee on Thursday, April 28, that the Ministry of Health had sanctioned the borrowing of £16,000 for the provision of new gas mains in the Devonport area. Tenders were accepted for the supply of the pipes, and a tender of £21,000 was also accepted for a new retort bench of nine beds, to replace the old plant. The Engineer reported that the output in March showed an increase of 5·45 p.ct. over the corresponding period of last year.

Officials and members of the Amalgamated Engineering Union visited the gas-works of the Oswaldtwistle District Council recently. They were shown round by Mr. A. F. Ames, the Gas Engineer, who was assisted by three members of his staff—Messrs. T. Haworth, W. Haworth, and Eric Farnworth—along with Councillor T. Scholes, Chairman of the Gas Committee. The party thoroughly enjoyed the inspection; and at the close a vote of thanks was moved to Mr. Ames and his staff, and to Councillor Scholes and his Committee.

STOCK MARKET REPORT.

BUSINESS on the Stock Exchange was quite satisfactory last week. The lower Bank Rate led to some heavy withdrawals, for investment, of money on deposit, and also stimulated a demand for the better class securities. Values of all Home Government stocks were well maintained, and the 5 p.ct. War Loan, *ex* June 1 dividend, closed at 100⅝. Among Colonial stocks the Indians were perhaps most in demand.

Home Rails continued in their depressed state. In the Industrial Market Artificial Silk shares were most sought for, and, notwithstanding the absence of dividends, there was considerable speculation in British Celanese. Tobaccos, in spite of occasional spurts during the week, were lower towards the close.

The was an unusually high number of transactions in the Gas Market; the Primitiva ordinary shares being particularly in demand. Confidence in this Company's future is evidently increasing, and the next accounts (due about the middle of May) will be awaited with interest. It will be observed that the general improvement in prices continues. This is, however, most noticeable in the stocks of the larger companies and in those operating abroad. Among the changes in the quotations is one fall of importance—that of 2 points in the North Middlesex 6 p.ct. consolidated, which is surprising having regard to the strength of the Company. Liverpool 5 p.ct. ordinary heads the list of improvements with a rise of 2 points, to 83-84, at the local exchange.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 29.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C.	70—75	..	..
222,992	,,	,,	4	4	Do. 4 p.c. Pref.	66—71	..	69½—70
1,551,868	,,	Apl. 7	6½	7	Alliance & Dublin Ord.	85—86	..	84½—85
374,000	,,	Jan. 13	4	4	Do. 4 p.c. Deb.	65—68	..	65½
200,000	1	Apl. 28	1/7½	1/7½	Bombay, Ltd.	1—1½*	..	21/3
170,000	10	Mar. 10	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
600,050	10	,,	7	7	Do. B 7 p.c.	11½—12½	..	12½—12½
275,000	10	,,	6	6	Do. Pref. 6 p.c.	10½—11½	..	11½—11½
50,000	Stk.	Jan. 13	3	3	Do. 3 p.c. Deb.	58—66	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	73—76	..	77—77½
357,900	,,	—	—	—	Brighton & Hove 5 p.c. Con.	100—105	..	..
341,800	,,	—	—	—	Do. 5 p.c. Con.	90—95	..	93½—94½
1,387,500	,,	Feb. 24	5	5	Bristol 5 p.c. max.	88—89a	..	..
885,000	,,	Mar. 24	8	7	British Ord.	105—108	..	..
100,000	,,	Dec. 30	7	7	Do. 7 p.c. Pref.	112—117	..	..
150,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	..	..
100,000	10	Dec. 9	8	6	Cape Town, Ltd.	7—8	..	..
100,000	10	Apl. 28	4½	4½	Do. 4½ p.c. Pref.	6—7*	..	..
150,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb.	68—78	..	..
626,860	,,	Feb. 24	6	6	Cardiff Con. Ord.	99—102	..	..
227,860	,,	Dec. 30	7½	7½	Do. 7½ p.c. Red. Deb.	100—103	..	..
197,150	,,	Feb. 24	5	6½	Chester 5 p.c. Ord.	86½—91½b	..	..
79,185	1	Apl. 28	†2/-	†2/-	Colombo Ltd. Ord.	26/—28/-*	—1/-	..
24,495	1	,,	1/4‡	1/4‡	Do. 7 p.c. Pref.	20/—22/-*	..	..
221,490	1	Apl. 7	1/9‡	1/9‡	Colonial Gas Assn. Ld. Ord.	24/6—26/6*	..	..
178,900	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-*	..	..
1,518,280	Stk.	Feb. 24	5½	5½	Commercial 4 p.c. Cap.	85—86	+1	86½—87½
480,000	,,	,,	5/8/4	5/8/4	Do. 8½ p.c. Cap.	84—87	+1	84½
475,000	,,	Dec. 30	8	8	Do 8 p.c. Deb.	54—57	..	55
800,000	,,	Sept. 30	§2	§1	Continental Union, Ltd.	28—38	..	29½—30½
200,000	,,	Mar. 10	7	7	Do. 7 p.c. Pref.	79—82	..	..
787,568	,,	Mar. 10	6½	6½	Croydon sliding scale	77—80	..	..
406,100	,,	,,	5	5	Do. max. div.	96—99	..	79½—79½
492,270	,,	Feb. 24	6	9	Derby Con.	104—106a	..	..
55,000	,,	Dec. 30	4	4	Do. Deb.	73—75c	..	..
209,000	,,	Mar. 10	5	5	East Hull Ord. 5 p.c.	76—80	..	..
80,000	,,	Dec. 30	5	5	Eastbourne 5 p.c. Deb.	92—97	..	..
1,008,180	10	Mar. 24	†3	†3	European, Ltd.	52—62	..	61½—61½
18,747,480	Stk.	Feb. 10	5/1/4	5	Gas Light & Coke 4 p.c. Ord.	87—89	..	87½—88½
1,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	59—61	..	60½—61
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	76—78	+½	76½—77½
6,852,620	,,	Dec. 30	3	3	Do. 3 p.c. Con. Deb.	58—60	..	58½—59½
181,815	,,	,,	—	6	Do. 6 p.c. Br'tf'd Rd. Db.	100—105	..	..
1,542,770	,,	,,	—	5	Do. 5 p.c. Red. Deb.	99—101	..	100½—100½
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
93,500	,,	Mar. 10	6½	6½	Hastings & St L. 5 p.c. Conv	90—92	..	..
248,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	67—72	..	..
70,000	10	Apl. 28	†10	†10	Hongkong & China, Ltd.	15—18*	..	..
172,200	Stk.	Mar. 10	5	5	Hornsey Con. 5½ p.c.	67—69	..	..
1,976,000	,,	Nov. 11	†10	10	Imperial Continental Cap.	140—143	+1	140—142½
223,180	,,	Feb. 10	3½	3½	Do. 3½ p.c. Red. Deb.	69—71	..	..
236,242	,,	Mar. 10	6½	6½	Lea Bridge 5 p.c. Ord.	92—97	..	..
2,146,907	,,	Feb. 24	5½	5½	Liverpool 5 p.c. Ord.	83—84b	+2	83—84
600,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	101—103b	..	..
165,786	,,	Feb. 24	9	8	Maidstone 5 p.c. Cap.	110—115	..	..
62,480	,,	Dec. 30	3	3	Do. 3 p.c. Deb.	52—57	..	..
75,000	5	Dec. 9	†7	†7	Malta & Mediterranean	5½—5¾	..	..
541,920	Stk.	Nov. 25	†6	†5	Montevideo, Ltd.	81—84	+1	83—84
2,061,815	,,	Feb. 24	5	5	Newcastle & Gateshead Con.	732—74½d	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	68½—69½d	..	..
691,705	,,	Dec. 30	8½	3½	Do. 8½ p.c. Deb.	65—69d	..	..
131,785	,,	—	—	—	North Middlesex 6 p.c. Con.	91—93	—2	..
800,000	,,	Apl. 28	9	7	Oriental, Ltd.	97—102*	..	..
188,130	,,	Dec. 30	7½	7½	Plym'th & Ston'house 5 p.c.	105—110	..	..
414,500	,,	Feb. 24	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	100—105	..	103
286,782	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	78
2,289,909	1	—	—	—	Primitiva Ord.	15/—16/-	+·/9	14/7½—15/9
282,200	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	85—87	..	..
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	70—72	..	71½
484,868	,,	Dec. 30	—	4	Do. 4 p.c. Cons. Deb.	70—72	..	..
150,000	10	Mar. 24	6	6	San Paulo 6 p.c. Pref.	7½—7¾	..	..
195,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	47—50	..	..
370,000	Stk.	Mar. 24	5½	5½	Sheffield A	95—97a*	..	..
419,968	,,	,,	5½	5½	Do. B	95—97a*	..	..
1,047,000	,,	,,	5½	5½	Do. C	95—97a*	..	..
90,000	10	June 11	4	—	South African	4—6	..	4½
6,609,895	Stk.	Feb. 24	5	7	South Met. Ord.	99½—101½	+½	99½—101
1,295,445	,,	Jan. 13	3	3	Do. 3 p.c. Deb.	57—60	..	58½
784,000	,,	Mar. 10	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	..
91,500	,,	Feb. 24	8½	8½	South Shields Con.	105—107d	..	..
1,343,795	,,	Mar. 10	6½	6½	South Suburban Ord. 5 p.c.	101—104	..	102½—104
368,837	,,	Dec. 30	5	5	Do. 5 p.c. Deb.	93—96	..	95
647,740	,,	Mar. 24	5	5	South'mpton Ord. 5 p.c. max.	74—77	..	..
121,275	,,	Dec. 30	4	4	Do. 4 p.c. Deb.	68—78	..	..
380,000	,,	Feb. 24	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	101—102
200,330	,,	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
130,000	,,	Feb. 24	7½	7½	Tottenham District A 5 p.c.	105—110	..	..
882,275	,,	,,	6½	6½	Do. B 6½ p.c.	80—92	..	90½—91½
160,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
161,255	,,	Dec. 9	4	4	Do. 4 p.c. Deb.	72—75	..	..
268,251	,,	Mar. 10	5	5	Tynemouth Con. and New	69—71d	..	..
197,294	,,	Mar. 10	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	85—90	..	87
88,360	,,	,,	5	5	Do. 5 p.c. pref.	83—88	..	..
91,800	,,	,,	6½	6½	Do. 5 p.c. Maidenh'd	83—88	..	..
30,600	,,	Mar. 10	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	120—125	..	..
258,655	,,	,,	7	7	Do. B 8½ p.c.	102—107	..	..
422,635	,,	,,	5/19/0	5/19/0	Do. C and New	90—95	..	..
859,000	,,	,,	6½	6½	Wimbledon 5 p.c.	98—103	..	..
96,000	,,	,,	7½	7½	Epsom 5 p.c.	103—108	..	..
88,416	,,	Dec. 30	8	8	8 p.c. Deb.	54—57	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div. † Paid free of income-tax ‡ Plus 8½ p.ct. p.a. special dividend. ½ For year.

The following transactions were recorded during the week:

On Monday, Bombay 21s. 3d., Bournemouth 7 p.ct. maximum 12⅛, 12¼, Bristol 5 p.ct. 87, Commercial 4 p.ct. 86½, 3½ p.ct. 84¼, Gas Light and Coke 87½, 87⅝, 87⅞, 88, 3 p.ct. debenture 58½, 59½, Primitiva 14s. 9d., 15s., 15s. 1¼d., South Metropolitan 99½, 100, 100⅛, 100⅜, 100½, South Suburban 5 p.ct. 103½, 104, Tottenham "B" 90½, 91¼. Supplementary prices, Barnet 5 p.ct. debenture 97, Leatherhead 4 p.ct. debenture 69½, 70, Metropolitan (Melbourne) 9⅜, 9½.

On Tuesday, Alliance and Dublin 84 11/16, 4 p.ct. debenture 65½, Bournemouth 4 p.ct. debenture 77, Commercial 3 p.ct. debenture 55, Continental Union 29¼, European 6¼, 6 5/16, Gas Light and Coke 87½, 87⅝, 87⅞, 88, 4 p.ct. preference 76½, 77½, 77⅝, 5 p.ct. debenture 100½, 100¾, Imperial Continental 140, 141, 141½, 142, Primitiva 14s. 10½d., 15s., 15s. 1¼d., South Metropolitan 99¾, 100, 101, 3 p.ct. debenture 58¾, South Suburban 5 p.ct. 103, 104, 5 p.ct. debenture 95, Uxbridge Maidenhead 5 p.ct. 87. Supplementary prices, Barnet 5 p.ct. debenture 97, British 5 p.ct. debenture 98. Hampton Court 5 p.ct. 104½, 104¾, Metropolitan (of Melbourne) 9⅜, 9½, Reading 5 p.ct. maximum 82½, 83, 83½, 84, Tunbridge Wells 7 p.ct. debenture 100½.

On Wednesday, Bournemouth 4 p.ct. debenture 77½, Commercial 4 p.ct. 87, 87½, Croydon maximum dividend 79¼, 79½, Gas Light and Coke 87½, 87⅝, 87¾, 88, 3½ p.ct. maximum 60½, 4 p.ct. preference 77, 77¼, 3 p.ct. debenture 59⅞, Montevideo 83, Primitiva 14s. 7¾d., 14s. 9d., 15s., 15s. 1¼d., 15s. 3d., South African 90s., South Metropolitan 100, 101, Swansea 7 p.ct. preference 101. Supplementary prices, Ascot original (10 p.ct. maximum) 9¼, 6 p.ct. preference £10 1s. 9d., Barnet 5 p.ct. debenture 97½, Canterbury "B" 123½.

On Thursday, Aldershot 4 p.ct. preference 69¾, 70, Bournemouth 6 p.ct. preference 11½, 11⅝, Commercial 4 p.ct. 87, 87½, East Hull 78¾, European 6 3/32, 6 1/32, Gas Light and Coke 87½, 87⅝, 87⅞, 3½ p.ct. maximum 61, 4 p.ct. preference 77½, 3 p.ct. debenture 59, 5 p.ct. debenture 100¾, Imperial Continental 142½, Montevideo 83, 84, Primitiva 15s., 15s. 1¼d., 15s. 3d., 15s. 4½d., 15s. 6d., 4 p.ct. debenture (1911) 71½, South Metropolitan 100¼, Swansea 7 p.ct. preference 102, Tuscan 20s. Supplementary prices, Eastbourne 5 p.ct. "A" 125, 125½.

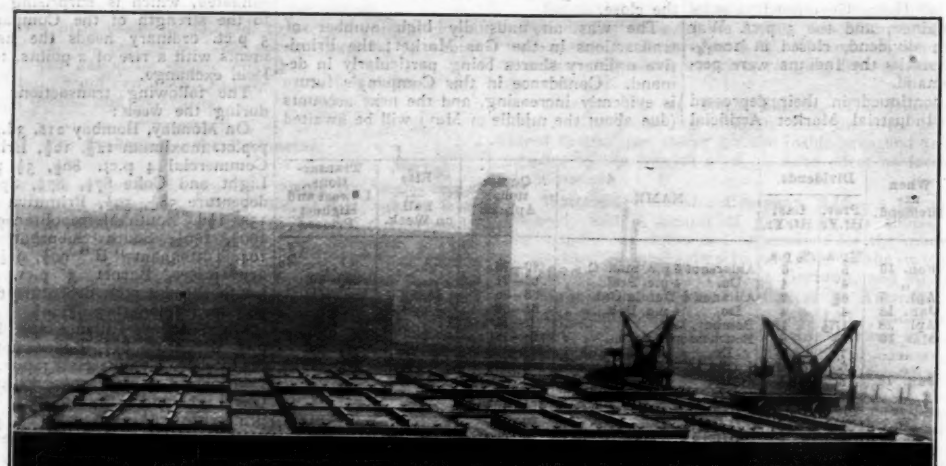
On Friday, Brighton and Hove 5 p.ct. 93½, 94, 94½, Continental Union 30⅜, Gas Light and Coke 87⅜, 87½, 88¼, 6 p.ct. debenture 100⅜, Imperial Continental 141, 141½, 142½, Portsmouth 4 p.ct. 103, 5 p.ct. 78, Primitiva 15s. 3d., 15s. 6d., 15s. 7½d., 15s. 8¼d., 15s. 9d., South Metropolitan 100, 100½, 100⅝, 101, South Suburban 5 p.ct. 102½, Tottenham "B" 90⅜. Supplementary prices, Barnet 5 p.ct. debenture 97½, Eastbourne 5 p.ct. "A" 125½, Southend-on-Sea 5 p.ct. debenture 91½.

Money was in abundance at the week-end. Clearing banks charged 3½ p.ct. for regular loans, but other lenders quoted 3½ p.ct. down to 3 p.ct. More stringent conditions are expected for the current week owing to the final call on the new 4 p.ct. consolidated loan. Treasury Bills averaged £3 13s. 1·07d. p.ct., or just under 1½d. p.ct. above the previous week's rate.

After some erratic fluctuations, Foreign Exchange values were steadier at the close of the week. The Italian rate moved within a narrow range and finished at 91⅝. Pesetas were less active, and closed unaltered at 27.56. The dollar-sterling was unchanged at 4.85½. French francs remained at 124. There was no movement in Belgas, the quotation being 34·93-34·94.

Silver was a dull market, India offering the metal at 25⅝d. per oz. Gold remained nominally at 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21. Bankers' deposit rates are 2½ p.ct. The deposit rates of the discount houses are 2½ p.ct. at call and 2⅝ p.ct. at notice.



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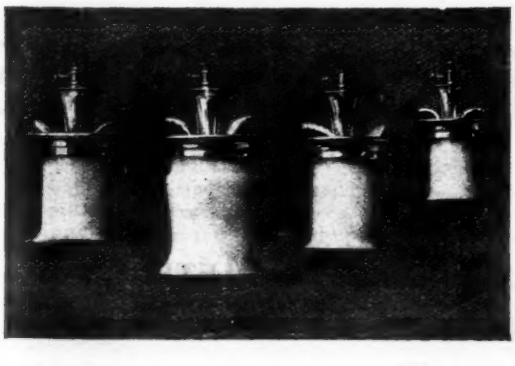
G.J. 11-5-27.



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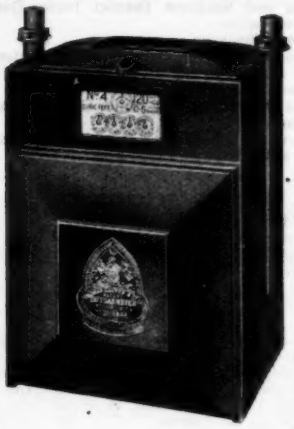

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